United States Court of Appeals

for the Second Circuit

EXHIBITS

76-7207

United States Court of Appeals

For the Second Circuit

Docket No. 76-7207

PRUDENTIAL OIL CORPORATION,

Plaintiff-Appellee,

vs.

PHILLIPS PETROLEUM COMPANY,

Defendant-Appellant.

ON APPEAL FROM THE UNITED STATES DISTRICT COURT
FOR THE SOUTHERN DISTRICT OF NEW YORK

(67 Civ. 3748 (C.L.B.))

EXHIBITS FOR JOINT APPENDIX

Volume V — E1180 - E1413

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EXHIBIT
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REQUEST FOR OIL IMPORT ALLOCATION

PUERTO RICO OIL & PETROCHEMICAL COMPANY

San Juan, P.R. - New York, N.Y.

June, 1963

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REPORT IN BRIEF

The purpose of this report is to outline the project for a petrochemical core industry as an essential part of the economic development of Puerto Rico, and to request an oil import allocation to establish this new industry.

NEED FOR A PETROCHEMICAL INDUSTRY

The economy of Puerto Rico will benefit by the establishment of a company whose express purpose is the development of a petrochemical industry.

Recent industrial development on the Island has resulted in the employment of primarily female labor. It is now urgent that new industry be directed towards the employment of male labor.

This industry will be the means by which a critically depressed area will be transformed into a strong, economic community.

A petrochemical industry will provide a major construction program; a major area development; an immediate petrochemical feed plant; and future petrochemical plants. This program is all based on continuing growth in this area of construction, operation, and new development in a continuing growth cycle, including support industries.

A petrochemical industry will compensate for the lack of indigenous raw materials on the island and will revive interest by U.S. chemical companies in establishing subsidiaries in Puerto Rico.

(See Chapter I)

CORE PLANT REQUIRED

The growth of a petrochemical industry depends upon a core plant to supply petrochemicals and chemical feed stocks. These products will compensate for the lack of natural resources and will provide raw materials for a petrochemical industry.

From a practical standpoint and in order to be economic, the plant must also recover and market the residual petroleum products which will be quite substantial, particularly in the early stages of operation, while additional petrochemical outlets are being developed.

The core plant is not to be a static specific refinery or petrochemical plant, but a flexible petrochemical raw material feed plant which will continue to supply additional petrochemical raw materials as they can be used.

The establishment of a core plant of this type is therefore the essential first step in the establishment of a growing petrochemical industry in Puerto Rico.

(See Chapter II)

ACTION BY COMMONWEALTH OF PUERTO RICO

To implement the establishment of this project, the Commonwealth of Puerto Rico has agreed to clear and provide land, housing facilities,

necessary building permits, assistance for support industries, port installation at Mayaguez, and other necessary related facilities.

The Commonwealth has stated that this project is of the highest economic priority, should proceed with utmost dispatch, and has their full support.

(See Chapter III)

COMMERCIAL IMPLEMENTATION

The purpose of the Puerto Rican Oil and Petrochemical Company is stated in the first paragraph of its charter, as follows:

> "The company is formed for the express purpose of developing a chemical and petrochemical industry in Puerto Rico. It will design and build a refinery to produce, initially, sulfur, aromatic petrochemicals and petroleum products. This refinery will be the basis of and feed plant for the petrochemical industry as it grows. The refinery will be designed so that petrochemical side streams can be withdrawn in the future. When these side streams are needed, the company will install the necessary additional facilities to purify them. The company will also promote additional chemical and petrochemical projects related to the development of the petrochemical industry."

Arrangements have been made with Phillips Petroleum Company to supply crude oil and to market the petrochemical and related petroleum products.

Sulfur will be marketed by PROPCO.

Monsanto Chemical Company has identified its interest in a chemical feed stock of high wax content.

Other petrochemical companies have expressed their interest in feed stocks for different petrochemical end products. These will be pursued and developed as soon as an oil import allocation is authorized.

A fueling station is planned for ships passing through the Mona Passage. This will be available to supply both commercial and military vessels.

In addition to providing a core industry necessary for the basic economic growth and development of Puerto Rico, the proposed company will place many American companies who wish to participate in a strong position to compete for world business.

PROPCO also proposes to build a satellite plant adjacent to the core plant to produce lead antiknock additives.

PROPCO dollar sales volume is expected to be 53% petrochemical and "non-quota" petrochemical fuels initially. As satellite petrochemical plants are built, the ratio of petrochemical sales will, of course, increase.

(See Chapter IV)

ENGINEERING PLANNING

Universal Oil Products Company has made a site investigation and has worked up a preliminary set of plans for the refining of Venezuelan crude to produce aromatic petrochemicals and petroleum products.

In order to be practical from an economic and marketing standpoint, these plans have been drawn up so the core plant will start up and operate with a minimum of difficulty, yet be so designed that side streams can be withdrawn for the separation and purification of petrochemicals as markets are developed or as they can be used by other companies for chemical feed stocks.

These plans include both capital and operating cost estimates, site recommendations, personnel requirements, and an estimated net operating income.

(See Chapter V)

FINANCIAL PLANNING

On the basis of the Universal Oil Products Company's engineering investigation, representatives of E. M. Warburg Company and Kuhn Loeb have worked up a financial plan for this project. This plan provides for maximum participation by citizens of Puerto Rico.

(See Chapter VI)

E 1188

STATUS OF PROJECT

Preliminary planning, selection of key personnel, and all other practical steps have been completed to initiate the project. Necessary assurances have been given to and received from the Commonwealth of Puerto Rico, and raw material supply and marketing arrangements have been made.

Before the construction of the core plant can be contracted, it is necessary to establish that crude petroleum will be available for the use of the company. Under the proclamation of March 10, 1959, "adjusting and Regulating Imports of Crude Oil and its Principal Products into the United States," there was a finding that...

> "The Commonwealth of Puerto Rico largely depends on imported crude oil...and that...the adjustment of imports...should permit imports into Puerto Rico adequate for the purposes of local consumption, export to foreign areas; and limited shipment of finished products to the Continental United States."

For reasons previously outlined, the need of a petrochemical industry for the Commonwealth has been given top priority in the economic development program.

The project needs only a license to import crude oil as raw material for its core plant to become a reality.

REQUEST FOR ALLOCATION

E 1189

A request for the allocation of 60,000 barrels per day of crude oil under the import quota allowance is hereby respectfully requested in order to proceed with this project for the establishment of a petrochemical industry in Puerto Rico.

# # #

CHAPTER I

NEED FOR PETROCHEMICAL INDUSTRY

Until recently the growth of the chemical industry in Puerto Rico has progressed rapidly. This progress has been remarkable because of the lack of natural resources on the island. A start has been made in petrochemicals by Union Carbide Caribe and Caribe Nitrogen with the manufacture of ethylene glycol and ammonia respectively.

However, recent plans for additional petrochemical plants have been either postponed or abandoned, and it is apparent that raw materials not otherwise available must be imported and extracted from petroleum.

The natural resources of Puerto Rico have been investigated* and found to be practically non-existant, except for sand, limestone, salt water, fresh water and sunshine. With fertile soil and fertilizer, sugar and its products are produced. This means the available raw materials for a chemical industry are sand, limestone, salt and sugar. Other materials must be imported or extracted from petroleum by a petrochemical industry.

The products which can be extracted from petroleum when combined with the products which can be produced from the other raw materials can form the basis of a thriving and continually growing chemical and

petrochemical community.

Recent industrial development on the island has been primarily in industries requiring female employment. Male employment has increased to some degree, but unemployment among men is still over 10%. Many of the unemployed are high school graduates who are ready and willing, but unable to find work.

The chemical and petrochemical industries are among the most rapidly growing industries today primarily employing male labor. The petrochemical industry is growing faster than the balance of the chemical industry and is accounting for the majority of the new investment in the chemical industry. In the period 1959 through 1961 approximately $3 billion was spent by the chemical industry for new plant construction. Of this, 61.4% was for petrochemical plants, 12.9% related to petrochemicals, and only 25.7% was for non-petrochemical construction.

In 1955 petrochemical production amounted to approximately 15 million tons, and in 1965 it is estimated to be over 40 million tons.

Concurrent with the establishment and growth of such an industrial community will be the redevelopment of a critically depressed area, the employment of male labor, and the establishment of support industries in related fields. This activity will require a continuing need for construction labor as well as predominantly male operating labor as each facility is completed.

The establishment of substantial communities, based upon support industry in the forms of machine shops, pipe shops, metal fabricating and welding shops, and electrical repair shops will also all result in increased male employment.

The need for a petrochemical industry in Puerto Rico is expressed in a report dated September, 1961, by the Commonwealth of Puerto Rico Office of Economic Research, entitled "The Chemical and Allied Products Industry in Puerto Rico"** and quoted in part below:

> "There are several reasons why great importance is attached to the need for an expanding petrochemical industry ...
>
> 1. A local petrochemical industry could substantially compensate for the island's lack of indigenous raw materials.
>
> 2. The industry affords permanent employment at relatively high wages.
>
> 3. The industry offers predominantly male employment; an offset to the fact that new employment opportunities generated by our development program to date have been largely female jobs (60%).
>
> 4. Because of the magnitude of petrochemical projects, a substantial volume of constructive employment and income is generated in the adjoining areas."

When this report was written, the following chemical and petrochemical projects were contemplated:

Polyethylene by Union Carbide Caribe

Naphthalene by Commonwealth Oil

Phthalic Anhydride by Stepan Chemical

Chlorine & Caustic Soda by Morton Chemicals

These projects have all been either postponed or abandoned. Some have been carried out elsewhere.

Other petrochemical projects recently abandoned or postponed are listed below:

Polyethylene by U.S.I. Chemical Division of National Distillers

Lead Antiknock Plant by Stepan Chemical

These projects may be revived by these same companies or by others if a petrochemical industry is established to provide feed stocks and/or markets for them.

New opportunities are constantly arising. As for example, the Puerto Rico Chemical Company has just announced plans for a 5,000,000 pound per year phthalic anhydride plant. Representatives of this company have told us that the feed stock they require is not available in Puerto Rico and that they must import their requirements. The feed stock they require is one of the petrochemicals we intend to manufacture in more than adequate quantity for their requirements.

The potential petrochemical complex is shown by a series of charts (No. 1 through 10) prepared by the Ralph M. Parsons Engineering Company. Chart 1 shows the primary products (petrochemical intermediates) which can be made and is the index to the other nine charts.

On Chart 1 the top six primary products can be made from either petroleum or natural gas; the lower products can be made only from petroleum.

The company intends to make the petrochemical products which can be made only from petroleum at first. These are the aromatics and the products which can be made from them are shown in Charts 8, 9, and 10.

The end products will eventually range from insecticides, herbicides, and solvents from the chlorinated hydrocarbons to synthetic fibers and film of the "Nylon," "Dacron," and "Mylar" type. The former will supply agricultural and dry cleaning industries and can be further processed chemically to make other chemicals such as Freon, which is used extensively in air-conditioning systems and as an aerosol propellent. The latter is only representative of one of the types of products which can be made. Nylon is the best material for commercial fish nets which could be manufactured for export and to supply the fishing vessels which supply the islands canneries. The list of possible products is beyond the scope of this report, and several volumes would be required for a complete listing of all possible future outlets.

*References to Natural Resources of Puerto Rico

Limestone & Marble Resources of Puerto Rico, 1958

Preliminary Report on Silica Sands of Puerto Rico, 1958

Preliminary Report on Calcitic Dolomite of Northern Puerto Rico, 1957

Beachrock in Northeastern Puerto Rico

A Survey of the Geology of Puerto Rico, 1954

Geology of the Carolina Clay Deposit, Puerto Rico

Geology and Ore Deposits of the Keystone Iron Mine Near Juncos, Puerto Rico

Stratigraphy, Sedimentation, and Structure of Late Cretaceous Rocks in Eastern Puerto Rico, 1960

Nickel-Cobalt-Iron-Bearing Deposits in Puerto Rico, 1959

Report of the Bureau of Mines, On the Mineral Resources of Puerto Rico, An Appendix to the Annual Report of The Bureau of Mines for the Fiscal Years 1939-1941

Preliminary Results of Geophysical Exploration for Gas & Oil on the North Coast of Puerto Rico

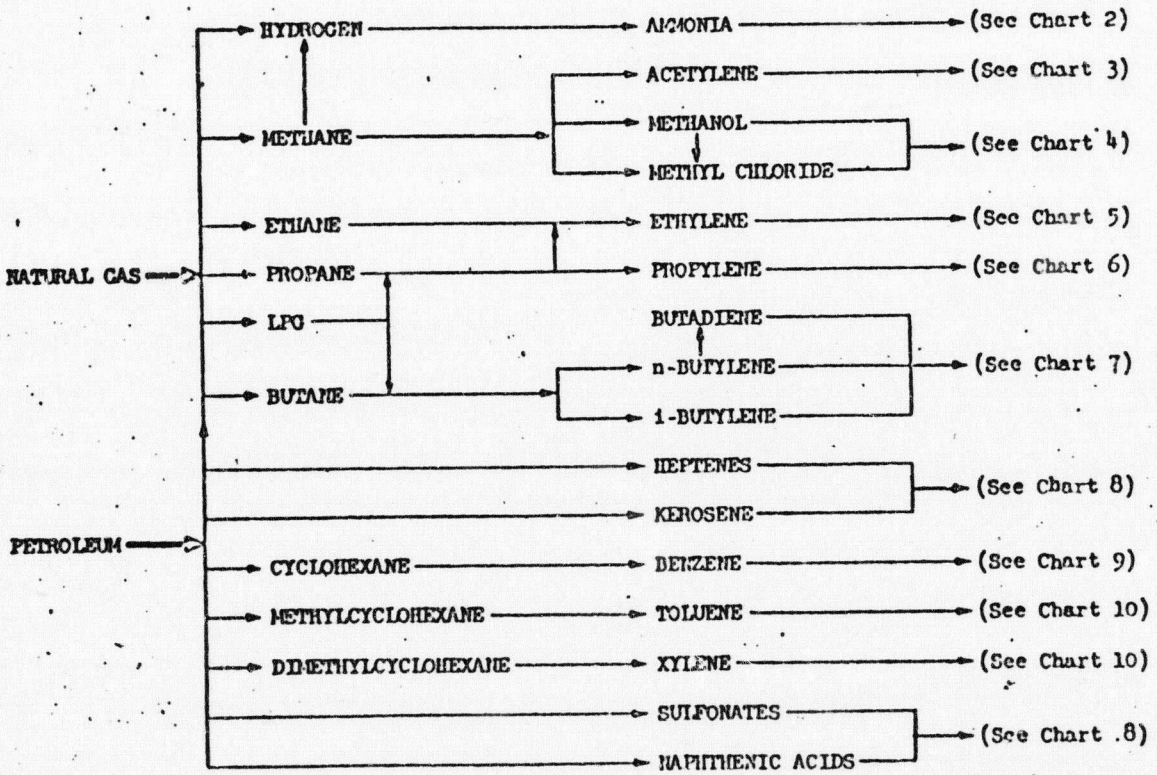
Preliminary Results of Geophysical Exploration for Gas & Oil on the South Coast of Puerto Rico

Industrial & Mineral Development in Puerto Rico, 1959-1962

**For Report in Full - See Appendix A

CHART 1

MAJOR PETROCHEMICAL INTERMEDIATES



THE RALPH M. PARSONS COMPANY

CHART 1

E 1196

E 1196

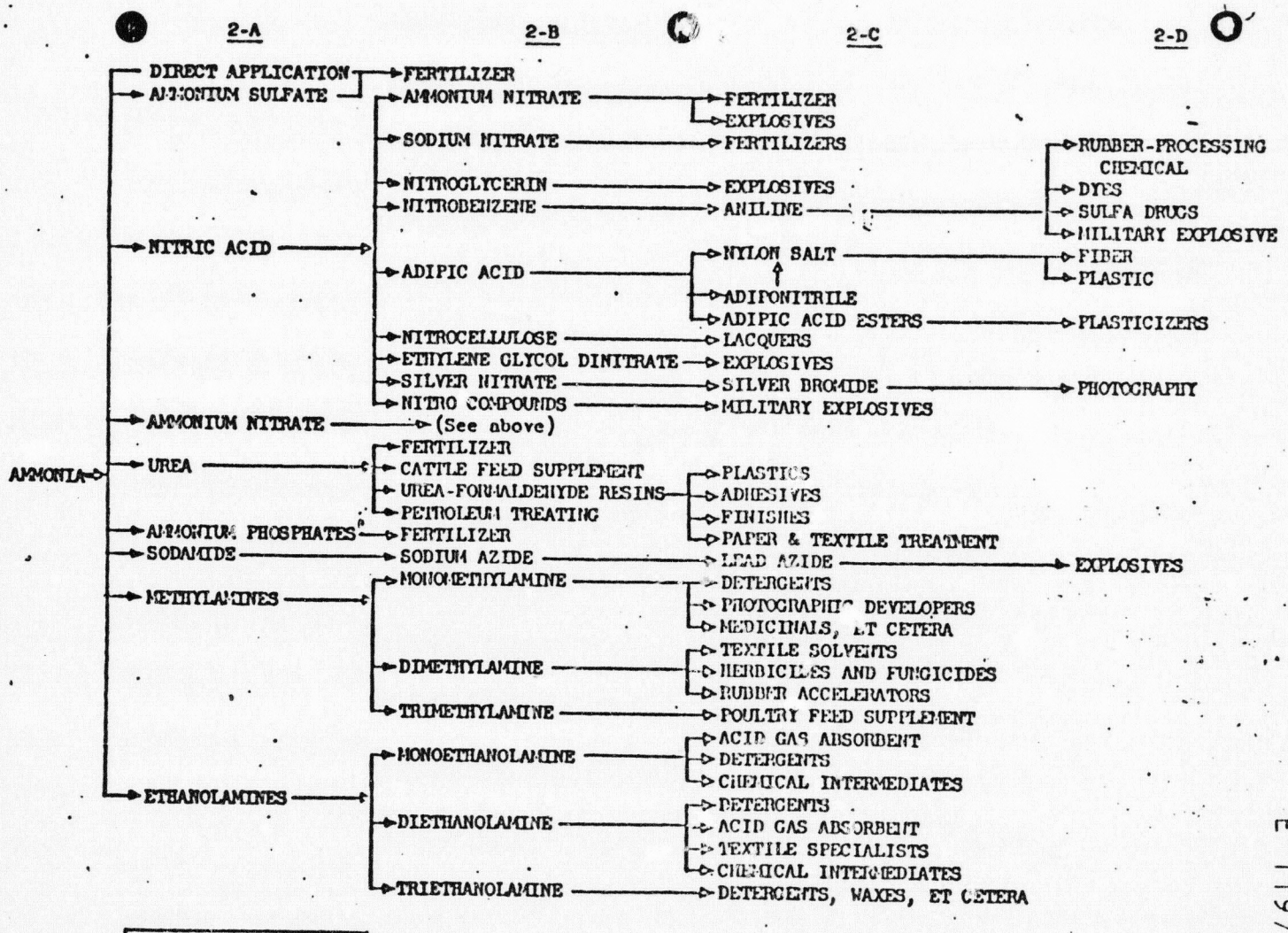


CHART 2
AMMONIA DERIVATIVES

THE RALPH M. PARSONS COMPANY

E 1197

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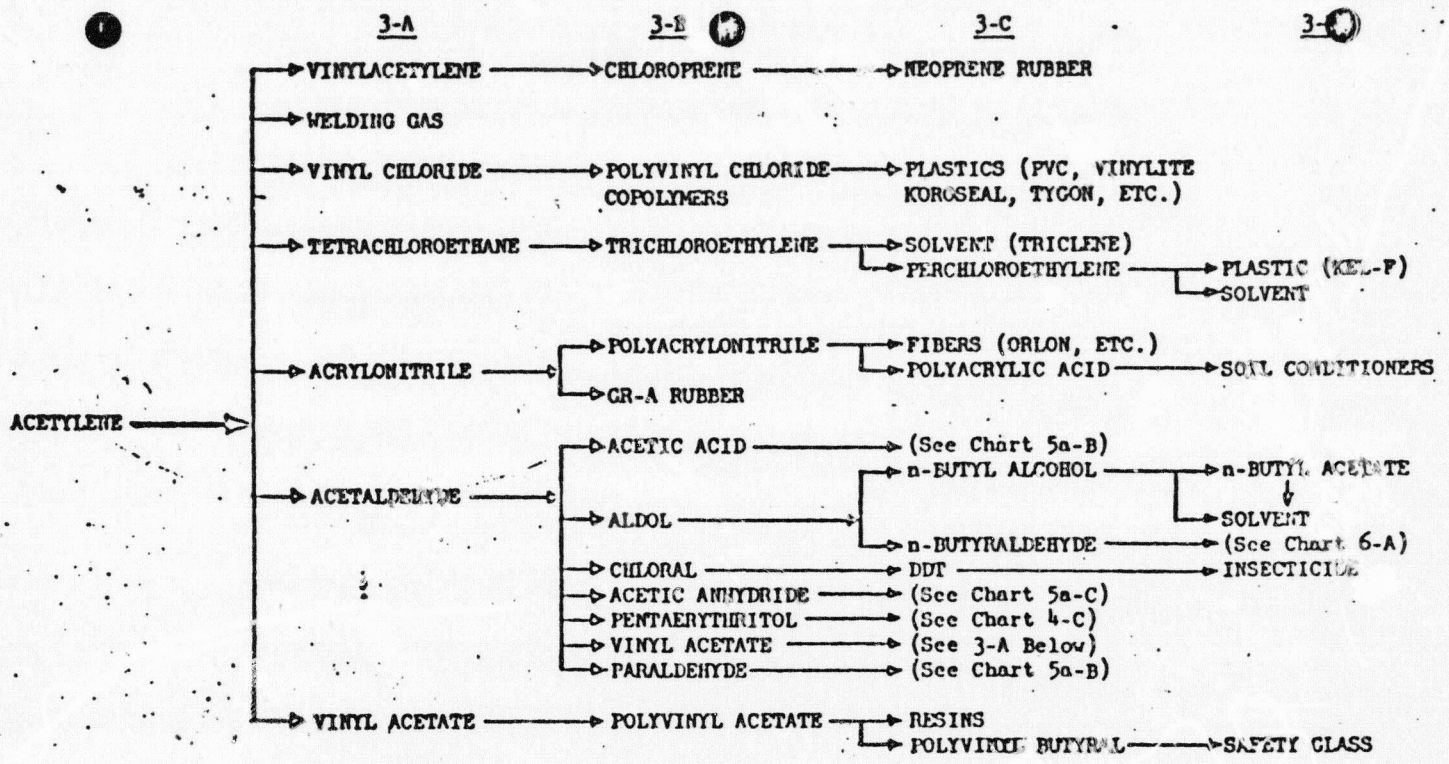


CHART 3
ACETYLENE DERIVATIVES

THE RALPH M. PARSONS COMPANY

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E 1199

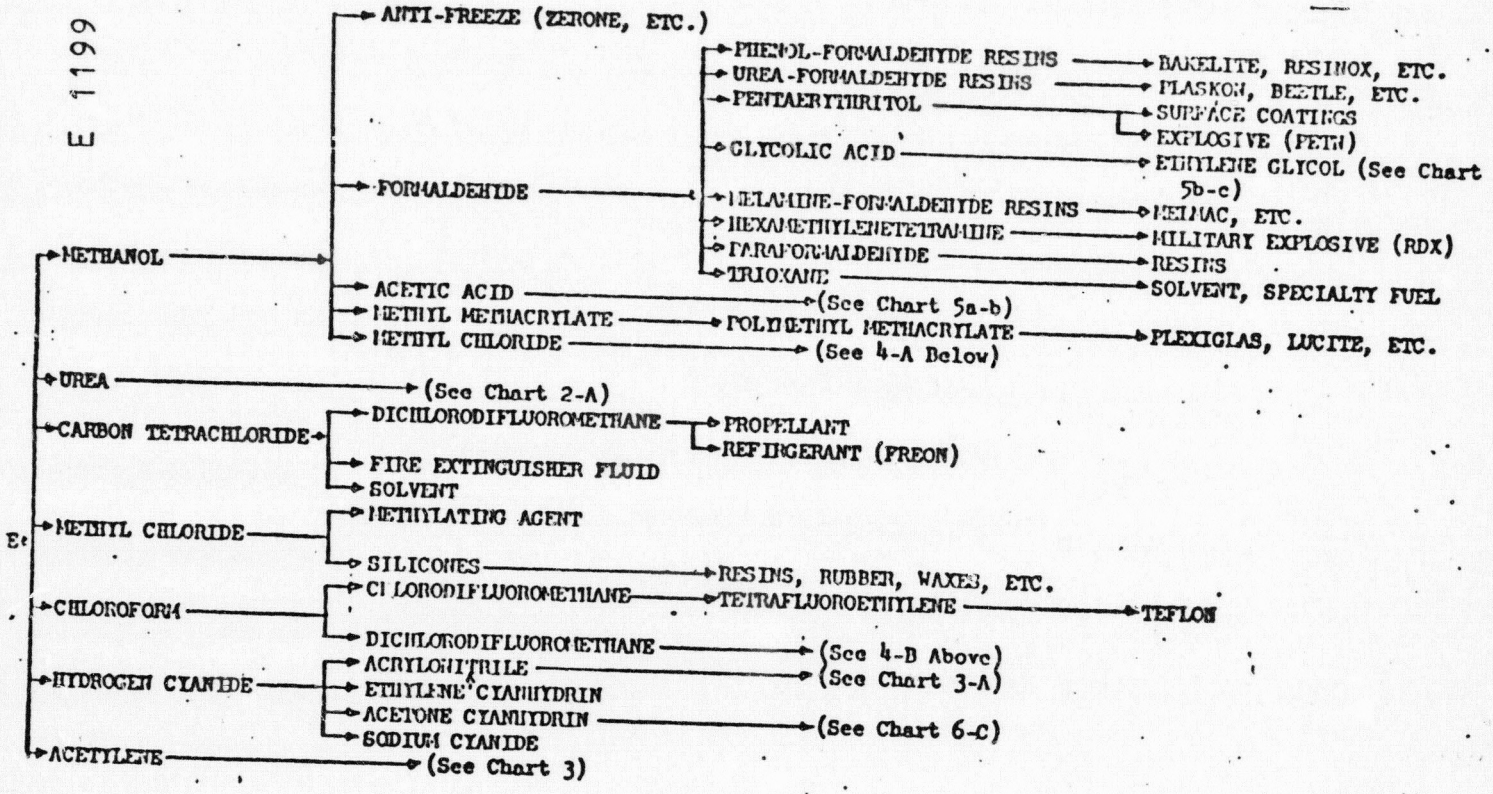


CHART 4
METHANE DERIVATIVES

THE RALPH M. PARSONS COMPANY

E 1199

E 1200

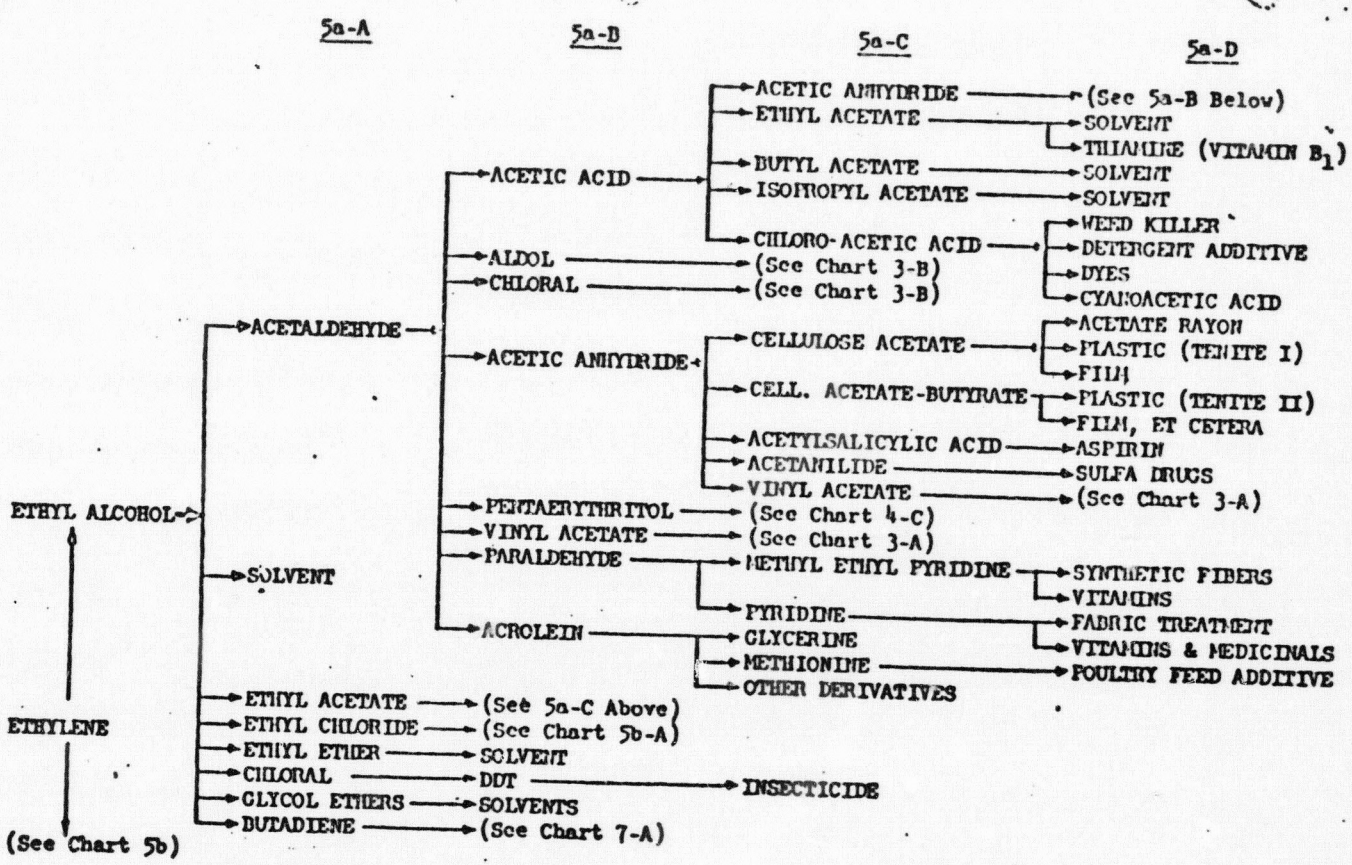


CHART 5a
ETHYL ALCOHOL DERIVATIVES

THE RALPH M. PARSONS COMPANY

E 1200

E 1201

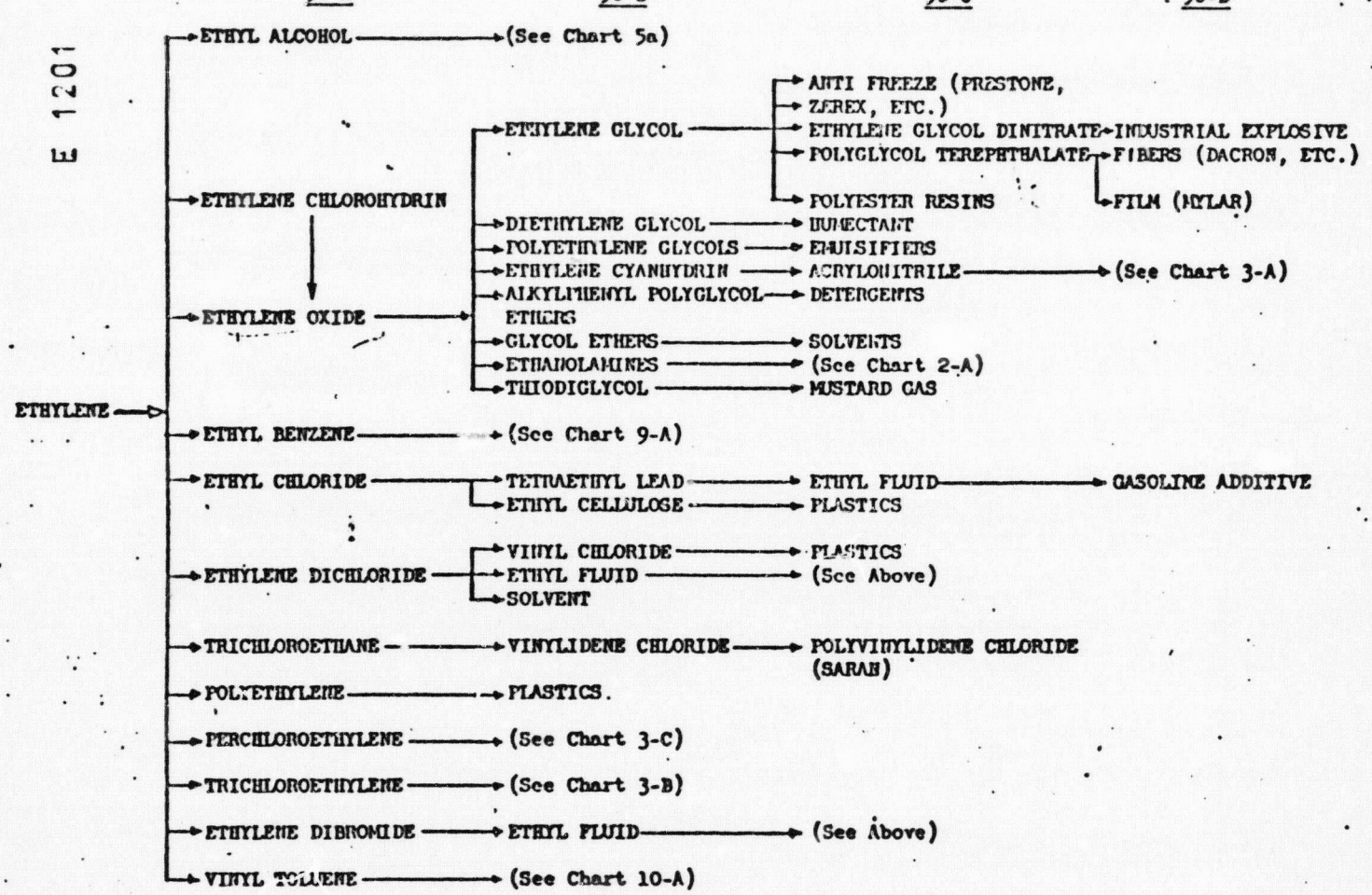


CHART 5b
ETHYLENE DERIVATIVES

THE RALPH M. PARSONS COMPANY

E 1201

E 1202

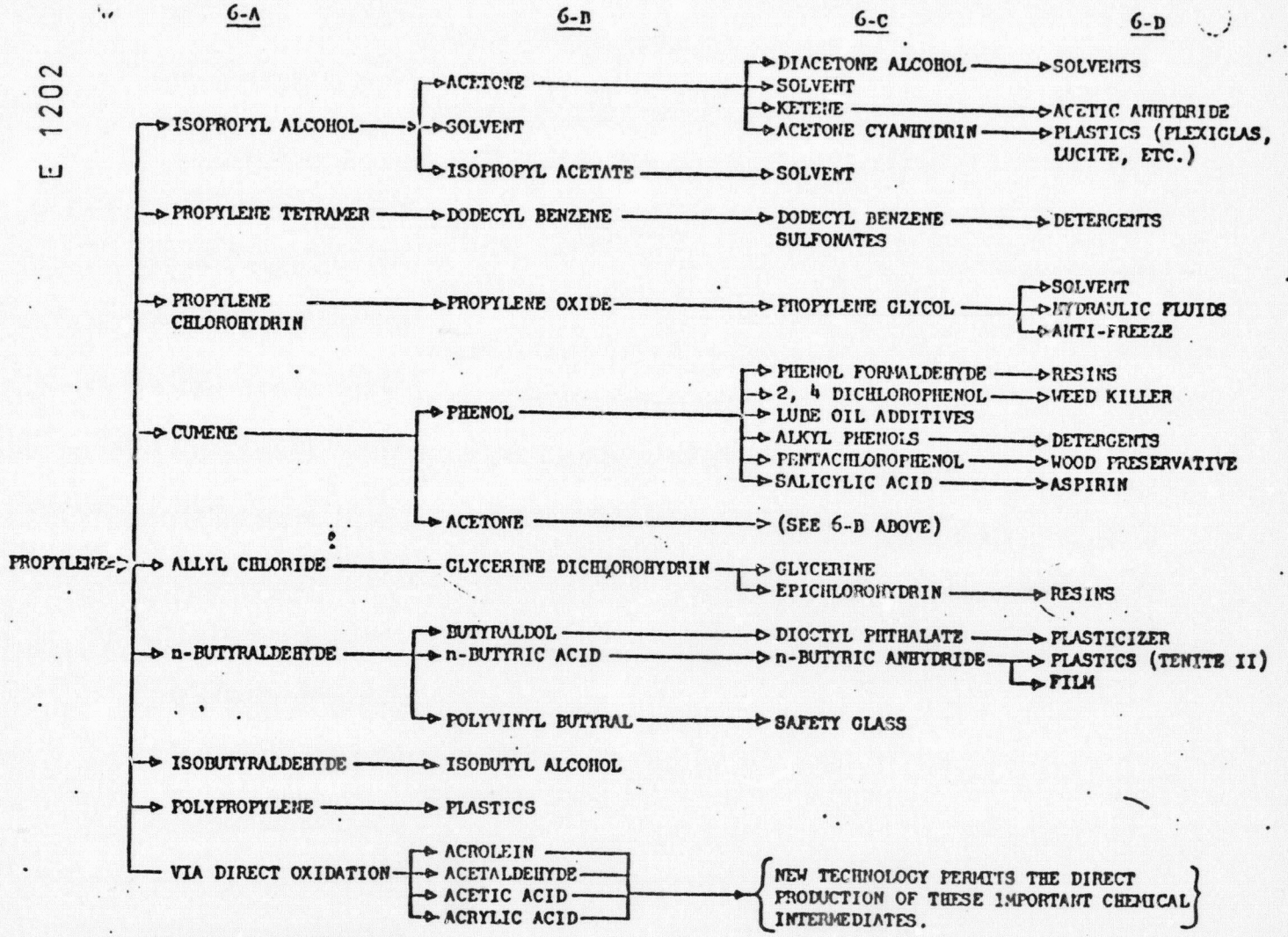


CHART 6
PROPYLENE DERIVATIVES

THE RALPH M. PARSONS COMPANY

E 1202

E 1203

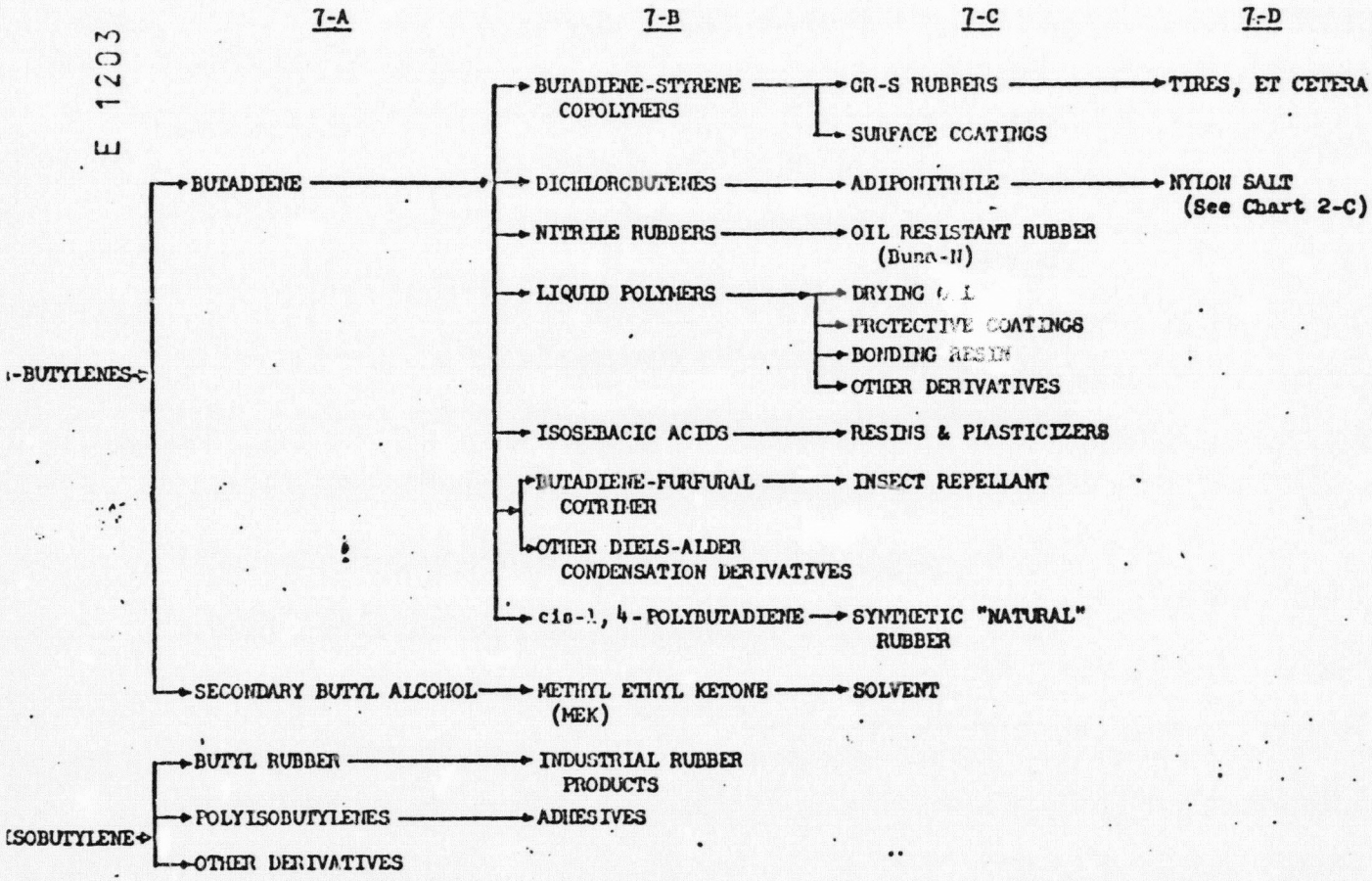


CHART 7
BUTYLENE DERIVATIVES

THE RALPH M. PARSONS COMPANY

E 1203

E 1204

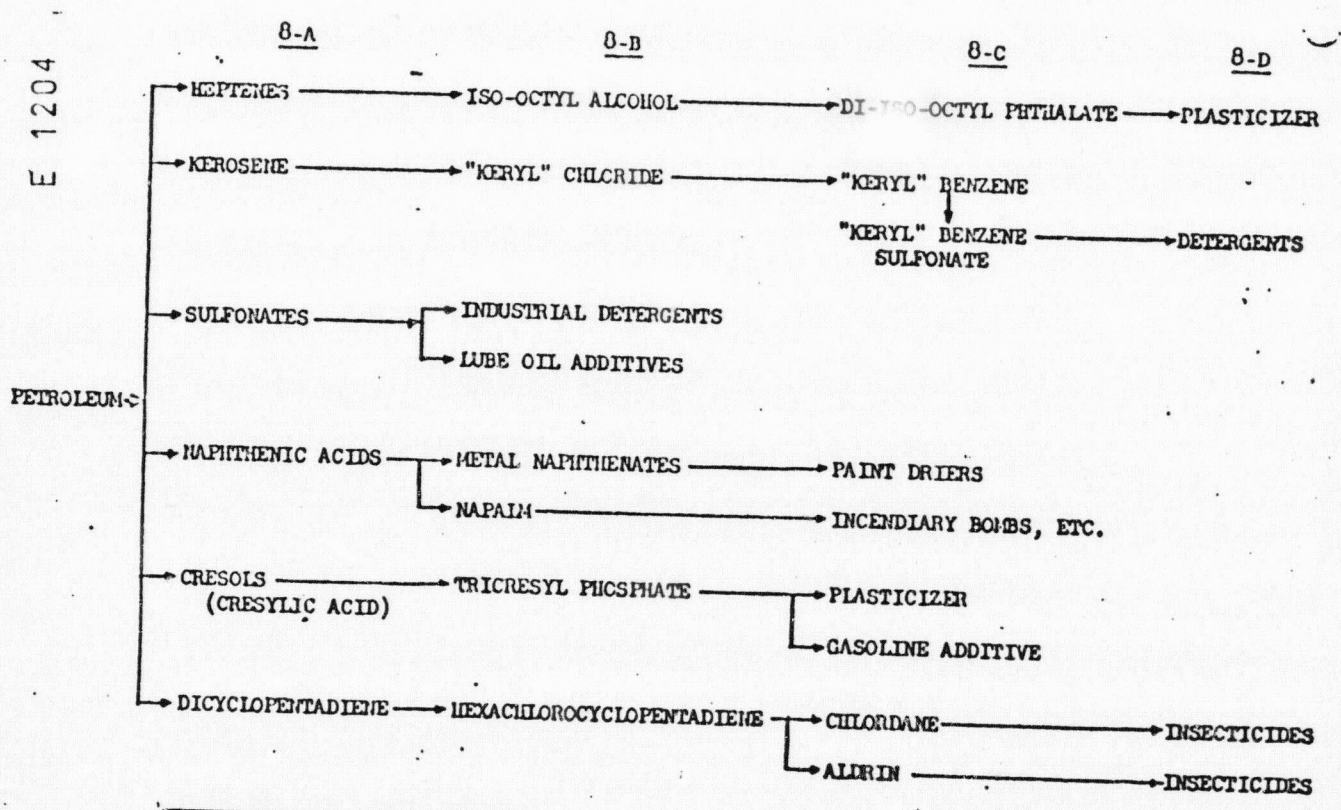


CHART 8
OTHER PETROLEUM DERIVATIVES

THE RALPH M. PARSONS COMPANY

E 1204

E 1205

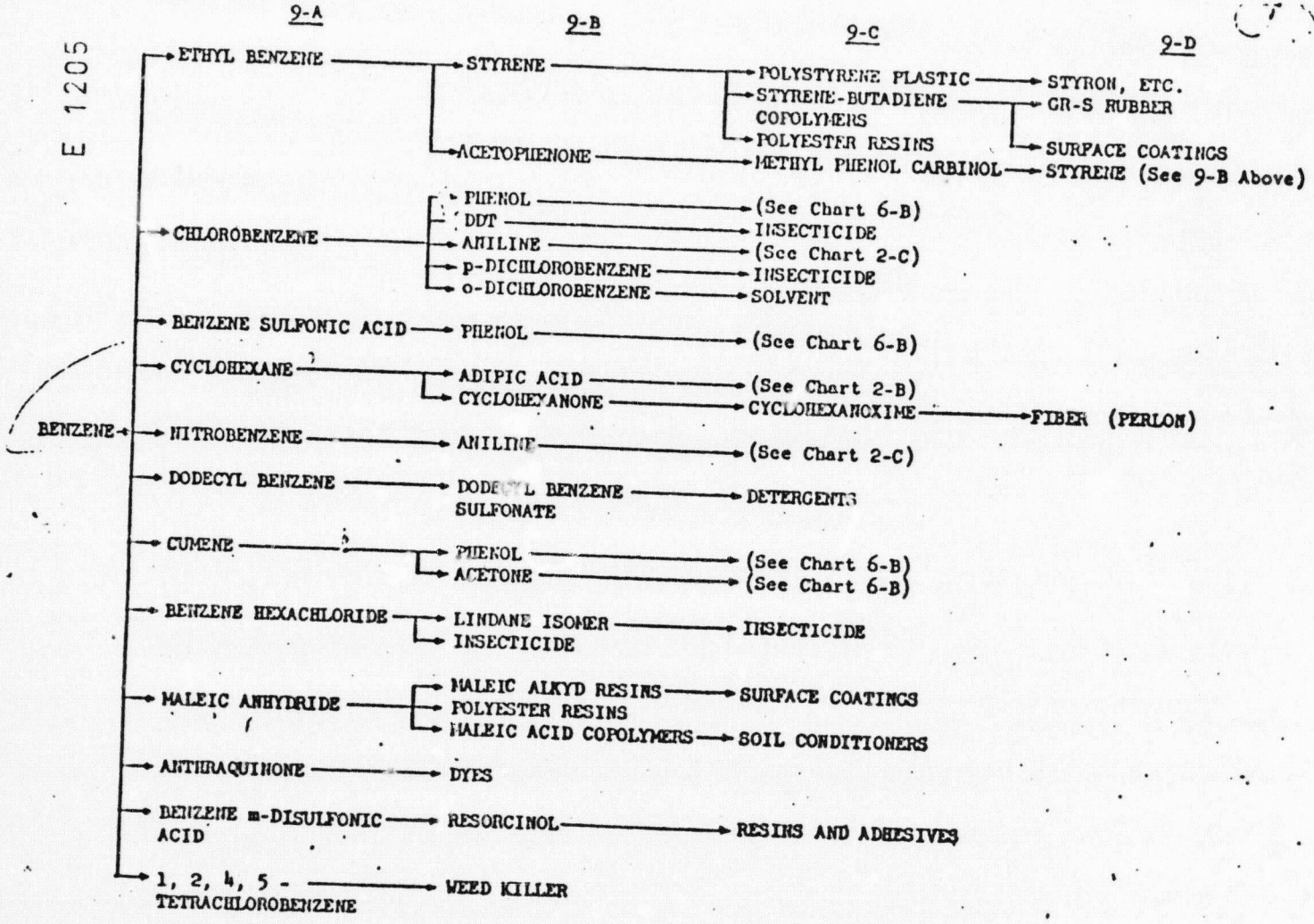


CHART 9
BENZENE DERIVATIVES

THE RALPH M. PARSONS COMPANY

E 1205

E 1206

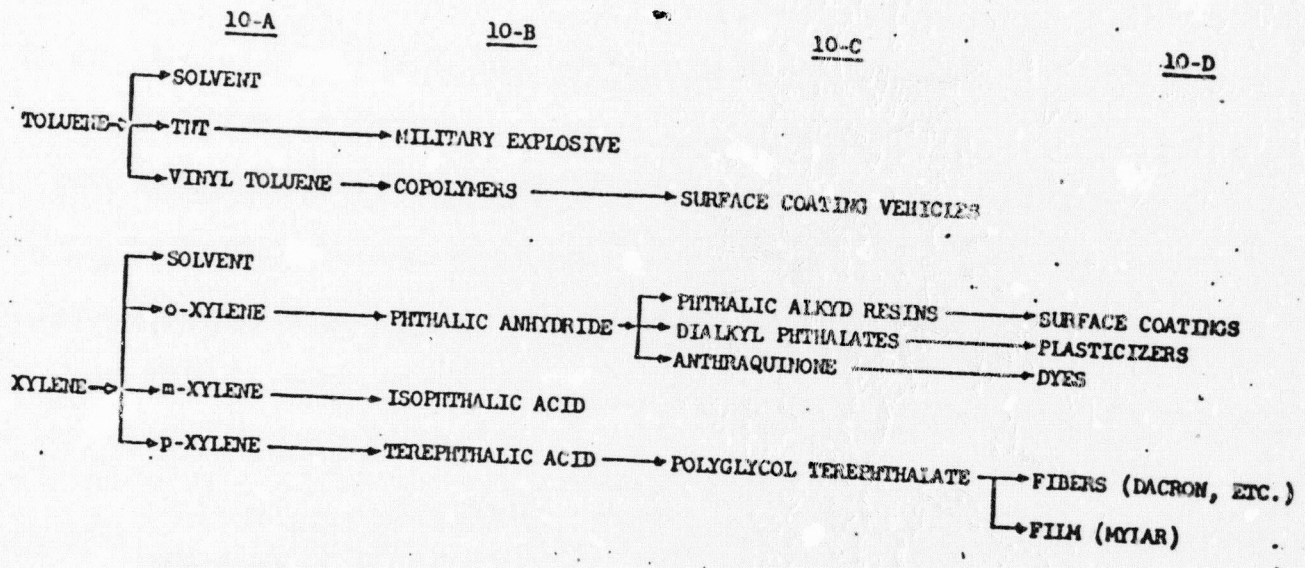


CHART 10
TOLUENE AND XYLENE DERIVATIVES

THE RALPH M. PARSONS COMPANY

E 1206

CHAPTER II

CORE PLANT

The first step in the development of a petrochemical industry is to establish a core plant to provide feed stocks and petrochemicals for the prospective petrochemical plants. The latter would be essentially satellites around the core plant which will extract and purify each raw material for each respective satellite plant.

Obviously, the entire complex of core plant and satellites cannot be established at once, but must be developed over a period of time. The question of where and how to start on a practical basis is thus presented.

A core plant is proposed to refine crude oil to produce sulfur, aromatic petrochemicals, chemical feed stocks, and residual petroleum products. This plant would be designed in such a manner that side streams can be withdrawn and additional petrochemicals and chemical feed stocks separated and purified as soon as markets can be developed or agreements reached for satellite plants. In this way the quantity of petrochemicals will increase and the petroleum fuels will decrease as the petrochemical industry grows.

Some LPG will also be made, and the balance of the products will be made as soon as demand can be developed.

Sulfur is not normally considered a petrochemical because it usually occurs naturally and is one of the basic chemical building blocks. However, because of no known deposits in Puerto Rico, sulfur is now imported. Since crude oil contains small amounts of sulfur, a sulfur recovery unit is planned as part of the core refinery.

Salt recovered from the ocean by solar evaporation is available from both the southwestern part of Puerto Rico and from other nearby islands. Salt is the raw material required for two other basic chemicals: chlorine and caustic soda.

It is expected that a chlorine and caustic soda plant will be built as soon as the plans for the core plant are announced. Chlorination and sulfonation of petroleum products plays a large part in the petrochemical industry and, together with existing requirements for chlorine, caustic soda and sulfuric acid, will certainly create sufficient demand for the establishment of these basic chemical industries.

The key then to a chemical and petrochemical industry in Puerto Rico is a core plant which is established for the express purpose of extracting chemicals, chemical feed stocks, petrochemicals, fuels and other petroleum products from crude oil. This plant is not just another refinery,

but a plant which is the first step in the development of a petrochemical industry and which is part of a company which is committed to a policy of continuing its efforts in the growth of a chemical and petrochemical industry for Puerto Rico.

# # #

CHAPTER III

SUPPORT OF THE COMMONWEALTH

In August, 1961, after an extensive survey of the chemical industry in Puerto Rico, the Economic Development Administration of the Commonwealth made it known to representatives of the company that a core plant for a petrochemical industry was sorely needed to provide raw materials otherwise not available for that industry. Representatives of E.D.A. have made this known to the Department of the Interior. They have started construction of port facilities in Mayaguez. They have agreed to clear and provide land for the core plant and set aside other land nearby for the satellite plants. They have agreed to provide housing, roads, and to redevelop a critically depressed area. They have agreed to assist support industries to provide services for the core plant and satellite plants. In essence, they have agreed to provide or assist in all items other than those facilities to be used solely by the core plant.

The Commonwealth has described the project for the establishment of a core plant for a petrochemical industry "as of the highest economic importance," and has requested that it move ahead "with dispatch."

# # #

CHAPTER IV

COMMERCIAL IMPLEMENTATION

The Puerto Rico Oil & Petrochemical Company (PROPCO) has been incorporated in the Commonwealth of Puerto Rico by both Puerto Rican and United States parties for the express purpose of building a core plant for the development of a petrochemical industry. Its intent in this regard is contained in the first paragraph of its charter, as follows:

> "The company is formed for the express purpose of developing a chemical and petrochemical industry in Puerto Rico. It will design and build a refinery to produce, initially, sulfur, aromatic petrochemicals and petroleum products. This refinery will be the basis of and feed plant for the petrochemical industry as it grows. The refinery will be designed so that petrochemical side streams can be withdrawn in the future. When these side streams are needed, the company will install the necessary additional facilities to purify them. The company will also promote additional chemical and petrochemical projects related to the development of the petrochemical industry."

In the event that any particular petrochemical feed stock cannot be produced economically, the company has agreed to produce any such petrochemical feed stock on a quasi-public utility basis.

Directors of PROPCO include qualified and interested parties in both Puerto Rico and the United States.

Both the officers and operating personnel of PROPCO have been selected on the basis of their proven performance in the chemical, petrochemical, petroleum and engineering and construction industries. Resume's of the Directors and Officers are attached hereto.

For the core plant to be economic and practical, raw material supply and marketing arrangements must be made.

Phillips Petroleum Company has agreed to supply crude and to market all petrochemicals and petroleum products not consumed by the petrochemical industry (See letter attached). Sulfur will be marketed by the company probably to Caribe Nitrogen Company who now imports about three times the sulfur capacity of the core plant.

Monsanto Chemical Company has identified its interest in using [illegible] to 20,000 bbl/day of a 30% wax distillate cut if the company can meet its requirements as to quality and time (See letter attached).

Discussions have been held with Mobil Chemical, U.S.I., Division of National Distillers, Celanese Corporation, and Allied Chemical. These companies have asked to be kept informed of developments and would like to give serious consideration to building petrochemical plants in Puerto Rico if a core plant is built.

The core plant will necessarily produce petroleum fuels. To assist in marketing these outside the Continental U.S., a fueling station is planned for ships passing through the Mona Passage. This station is planned for both commercial and U.S. Naval vessels, and for tanker shipments of military fuels.

Captain O. W. Stafford SC USN Director, Purchase Division, reported at the September 21, 1962, meeting of the National Petroleum Refiners Association that $300 million is spent annually by the U.S. Navy for overseas fuels. At this same meeting, Col. R. W. Beer, USAF, Director, Planning and Comptroller Division, submitted an excellent series of charts showing details of military procurement which showed the Caribbean to be the largest single source of military tanker cargoes. Details of the reports at this meeting are attached.

If the core plant is built, the company will consider building a tetraethyl lead antiknock plant large enough to supply all the antiknock requirements of Puerto Rico. Imports were over 4 million pounds in 1960* for the two existing refineries. The core plant would use an additional 1 million pounds which would make a 5 million pound antiknock plant practical.

*From data received from the Economic Development Administration of the Commonwealth of Puerto Rico.

Initial sales volume is expected to be slightly over 50% petrochemical and "non-quota" petroleum fuels and slightly under 50% petroleum fuels which may be imported into the continental United States. As satellite petrochemical plants are built petrochemical sales will, of course, increase. A breakdown of the initial sales forecast is as follows:

Wax feed stock 30% (gross)	10%	Net
Other petrochemicals	18%	
Fuels to Military & Mona Passage vessels	25%	
Fuels to be shipped to continental U.S.A.	47%	
Total	100%	

E 1215

Officers & Directors

Puerto Rico Oil & Petrochemical Co.

President Chief Operating Officer	Mr. Thomas Young, Professional Chemical Engineer. Formerly a partner in Singmaster Breyer, consulting engineers, and a Vice President of Houston Chemical Company.
Vice President Technical Director	Mr. Herman W. Behme, Chemist. Formerly of Stauffer Chemical and Dorr-Oliver Company, and Vice President of Houston Chemical Company.
Vice President Operations	Mr. A. Dale Fischbeck, 30 years experience in production, operation and marketing of petroleum, currently serving Phillips Petroleum in this capacity.
Vice President Marketing & Public Relations	Mr. John W. Little, formerly Director of Advertising, Wellington Sears Company, and currently Vice President Marketing, Prudential Oil Corporation.
Vice President Finance	Mr. Frank Larson, Director of Prudential Oil Corporation and Treasurer of Avco.
General Counsel	Mr. Oscar Chapman, Formerly, Secretary of Interior, a partner of his own law firm in Washington, D. C.

PLF Exhibit No. 163 [illegible]
[illegible] 3/13/72

Financial Consultants	E. M. Warburg Company, New York, New York
Accountants	Price Waterhouse Company

Board of Directors

Mr. Nathan M. Shippee - Chairman

Mr. Jorge Bird

Mr. Rafael Carrion

Mr. Hector Ceinos

Mr. Oscar Chapman

Mr. Walter Gruber

Mr. Frank Larson

Mr. John Little

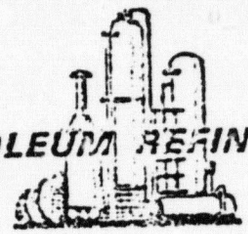
Mr. John Neikirk

Mr. Gustavo Podilla

Mr. Edward Willey

Mr. Thomas Young

E 1218



NATIONAL PETROLEUM REFINERS ASSOCIATION

FALL MEETING

PROCEEDINGS OF DEFENSE PETROLEUM SUPPLY CENTER PRESENTATION
(September 21, 1962)

REMARKS BY
Colonel Leon Stann
on behalf of
Rear Admiral T. L. Becknell, Jr.

DFSC'S ROLE IN PETROLEUM
Colonel R. W. Beers, USAF
Director, Planning and Comptroller Division

PROCUREMENT OF PRODUCTS
Captain O. W. Stafford, SC, USN
Director, Purchase Division

PROCUREMENT OF SERVICES
Colonel S. O. Benner, USAF
Director, Service Contracts Division

LEGAL ASPECTS OF DPSC CONTRACTS
C. F. Pollock
Counsel

Presented at the
NPRA FALL MEETING
Washington, D. C.
September 19-21, 1962

416 Beacon Building
Tulsa, Oklahoma

927 Munsey Building
Washington, D. C.

OPENING REMARKS

by

E 1219

Colonel Leon Stann, USAF

On behalf of Admiral Becknell and the Defense Petroleum Supply Center, I wish to express our appreciation for the privilege of meeting with the National Petroleum Refiner's Association. Admiral Becknell asked me to extend his sincere regrets that he is unable to attend. As you know, the Admiral is on an extended tour of temporary duty in Far East Asia.

We regard meetings such as this as a very valuable channel of communication between the Petroleum Industry and the Military. I hope that during the question and answer periods that you will feel free to raise any points that need clarification or amplification. We are here to listen and learn as well as to present information. The more thorough the exchange of information, the better equipped we will be to insure that the U.S. Military Forces are adequately supplied with the types and quantities of petroleum products they require.

I am certain that you recognize the importance of petroleum to the economies and defense efforts of the Free World; and, you need no reminder of the importance of petroleum to those countries that lie behind the Iron and Bamboo Curtains.

Our chances of success or failure in any future conflict hinge on oil. The sobering truth is that petroleum availability can make or break any military operation in modern war. With the dramatic, but still very limited exception of nuclear-powered naval vessels, the Armed Forces of all Nations are committed exclusively to hydrocarbon fuels to power their complex weapons systems.

The magnitude of military petroleum consumption is staggering by any standard of comparison. At present, our peacetime usage is running at the rate of approximately 36 million gallons a day. This is an increase of 21 million gallons a day since 1950. For example, jet fuel requirements have risen from zero 14 years ago to the present level of 17 million gallons a day. The modern military machine literally thirsts for oil. Guns, tanks, ships, planes and even most missiles need petroleum fuels and lubricants -- and in great quanitites. Concurrent with increased consumptions, there has been a gradual evolution toward greater complexity and more stringent requirements with respect to petroleum products, and their application to equipment. Materials and equipment are being stressed to their limits to meet the performance requirements of the aero-space age. Accordingly, fuels, lubricants and hydraulic fluids will have to withstand greater stresses - some known today - others to be specified in the future. Thermal stability, storage stability, cleanliness, luminometer number, BTU content, and many other characteristics are becoming increasingly important. We are continuously developing new specifications and amending existing ones. In most instances the requirement are becoming tighter. The capability of industry to produce more and better products is becoming increasingly important.

I mention these points not to impress you -- but rather to drive home the basic point that given the global commitments of the U.S. and the key importance of petroleum to support our forces, we - meaning both the Military and Industry - are faced with a tremendous logistic problem. We dare not fail, for nothing less than survival is at stake! We have depended heavily upon the petroleum industry in

the past, and have always received outstanding support. I think it is accurate to say that we expect to remain heavily dependent upon the Petroleum Industry as far into the future as we can presently see. I am confident that we can continue to depend on your outstanding support!

Once again I would like to express our sincere appreciation for being able to participate in this meeting.

xxx

DPSC'S ROLE IN PETROLEUM

by

E 1221

Col. R. W. Beers, USAF

The Defense Petroleum Supply Center rang in the year of 1962 with a transfer from Department of Navy to Defense Supply Agency management and our name was changed from the Military Petroleum Supply Agency to its present designation.

Since the first of January, procedures have changed but there has been no change in the basic objective of providing effective logistic support to the Military forces at the lowest possible cost to the taxpayers.

The Defense Supply Agency, or DSA to use its alphabetical short title, attempts to achieve this basic objective under the principle of decentralized operations with centralized policy and guidance. At present, DSA has two service activities - Traffic Management and Logistics, and line Commodity Supply Centers - Petroleum, Subsistence, Constructions, Medical, General Supplies, Industrial Supplies, Clothing and Textiles, Electronics Parts and Automotive Parts. These DSA field elements perform a wholesaler function for the Military Services.

To perform its mission, DSA currently employs approximately 21,000 military and civilian personnel. About 550 of them are employed in DSA Headquarters. By 30 June 1963, it is anticipated that the total employment will rise to approximately 25,300. About 1,000 will be military personnel from the four Services.

DSA Supply Centers now manage an inventory of 262,021 line items valued at 1.75 Billion dollars. This will increase to 1,200,000 items with a value of 2.6 billion dollars by the close of Fiscal Year 1963.

DSA also administers Defense-wide programs for cataloging, standardization, inter-servicing and surplus disposal which covers about 3.5 million items in the Military Supply System.

Studies to determine the range of additional items susceptible to integrated management by DSA are underway. Included are industrial production equipment, common chemical supplies and aeronautical spare parts. The total inventory value of those items is nearly ten billion dollars.

I mentioned previously that the DSA Supply Centers operate on a decentralized basis. DSA Headquarters provides overall leadership, coordinates policy and procedures and exercises the management functions related to budgeting, fiscal control and accounting, and programming.

This resumé of the Defense Supply Agency provides a bird's-eye view of the organization of which the Defense Petroleum Supply Center is a member.

Now let us look specifically at the mission, functions, and operations of the Defense Petroleum Supply Center in the world-wide petroleum logistics systems. (1) In our mission there is a definite distinction and differentiation between our scope of operations and that of DSA Commodity Supply Centers.

First, the scope of our commodity assignment is presently limited to the extent that neither ownership nor funding by a single stock fund is provided for the management of all petroleum products. We do not compute new requirements, nor do we exercise stock financing. These functions are still the responsiblity of the individual services. However, in May 1961, the Deputy Secretary of Defense assigned the responsibility for centralized management including stock funding of packaged petroleum products, some 938 items - lubricants, grease, oil, etc. We are in the process of finalizing our procedures for this responsiblity which we will implement 1 October 1962.

Secondly, we differ in our scope of operations from other Commodity Centers in that our responsibility does not end at the waters edge of the Continental U.S. We procure, furnish services, and distribute petroleum products on a world-wide basis. I will elaborate on this later in the briefing.

(2) The principal functions assinged are to -

1. Conduct world-wide procurement of products for the Military Services and some other non-Military Government Agencies.
2. Determine source of product for Army and Navy, arrange tanker transportation and place Army/Navy bulk orders for overseas and East Coast requirements.
3. Coordinate interservice supply support (world-wide responsibility).
4. Contract for storage and services.
5. Direct the procurement inspection program.
6. Coordinate cataloging.
7. Coordinate standardization nationally and internationally (NATO).
8. Coordinate petroleum training, and
9. [illegible]s the Commodity Manager on packaged petroleum products 1 October 196[illegible]

(3) Chart on Governmental Agencies involved in petroleum

(4) DPSC Organization and Functions

To carry out our responsibilities we are presently authorized 212 civilians and 22 officers. Recently we have undergone a reorganization to afford a better posture for assumption of these increased responsibilities.

Planning and Comptroller Functions have been combined under a single division. I wish to point out that the function of industrial mobilization planning is retained by the Office of Petroleum Logistics Policy headed by Admiral Biggs.

Procurement Functions are divided between our Purchase Division, which contracts for products, and the Service Contracts Division, which contracts for services connected with storage, dispensing and testing of petroleum products, etc.

Total world-wide military petroleum requirements during Fiscal Year 1962 rose to a post World War II peak of 317.8 million barrels of product. This vast military usage is equivalent to a consumption of over 70 gallons of petroleum for each man, woman and child in the United States.

Domestic military aviation fuel consumption accounts for approximately 66 per cent of all jet fuel and 51 per cent of all aviation gasoline used in the United States.

Distribution is responsible for coordinating the management in conjunction with MSTS and the Services of bulk petroleum movements by tanker. These movements constitute approximately 50% of our procurement.

Technical. Under our Technical Division are centered the responsibilities for cataloging, standardization, procurement inspection and quality control, and technical support to the overseas commands. I feel that we have made enviable progress in standardization with an item reduction of approximately 40% since 1957.

(5) Chart on Tanker Cargoes

This Chart depicts the magnitude of the management of tanker operations. The octopus indicates the flow of tankers. I wish to emphasize that we move product from the Caribbean and Gulf to the East Coast of the United States, and from the Gulf to the West Coast, in addition to movement to the overseas areas.

(6) Chart on Procurement

It is interesting to note, as depicted by this Chart, that because of the economic situation in oil - and we like to say as a result of better efficiency in procurement - we are buying more product for less money. The average volume over the past three Fiscal Years of products procured has been 288 million barrels per year.

(7) Chart on Distribution of the Procurement Dollar

In spending our procurement dollar, where does the money go? This Chart indicates a break-out based on volume and cost per gallon, the amount that we are currently expending of the defense dollar for procurement by major product.

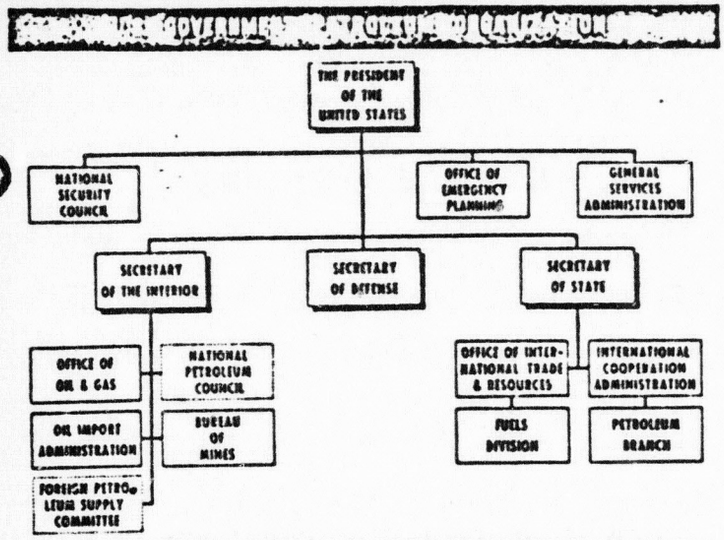
(8) Chart on Trends of Fuels

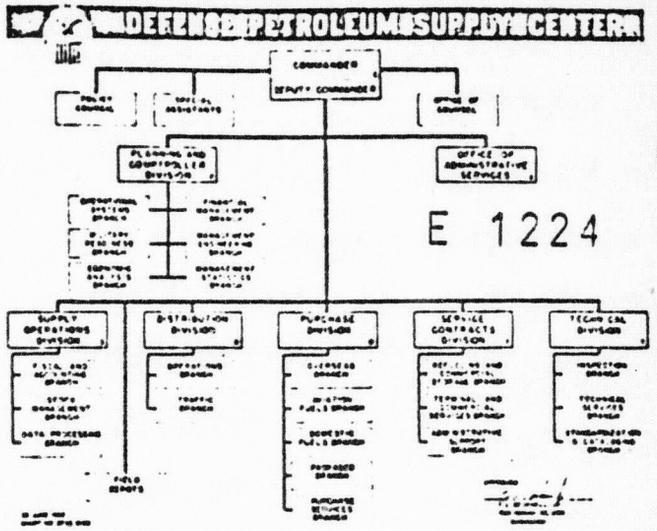
We have discussed procurement from the dollar point of view, and this Chart indicates percentage-wise the amount of volume by product of the average of 288 million barrels annually.

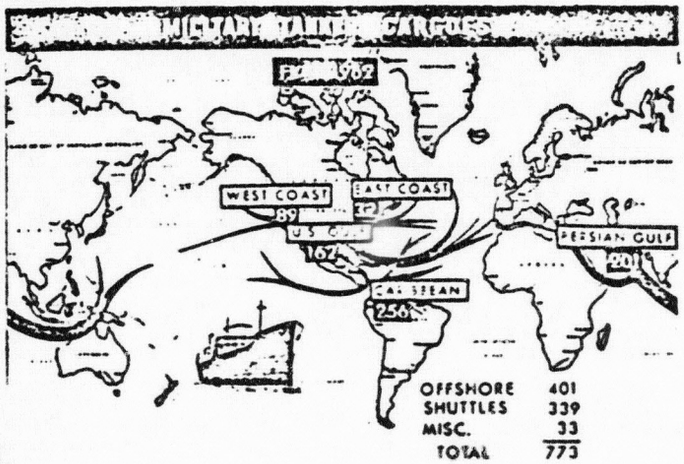
(9) Chart on JPO Organization

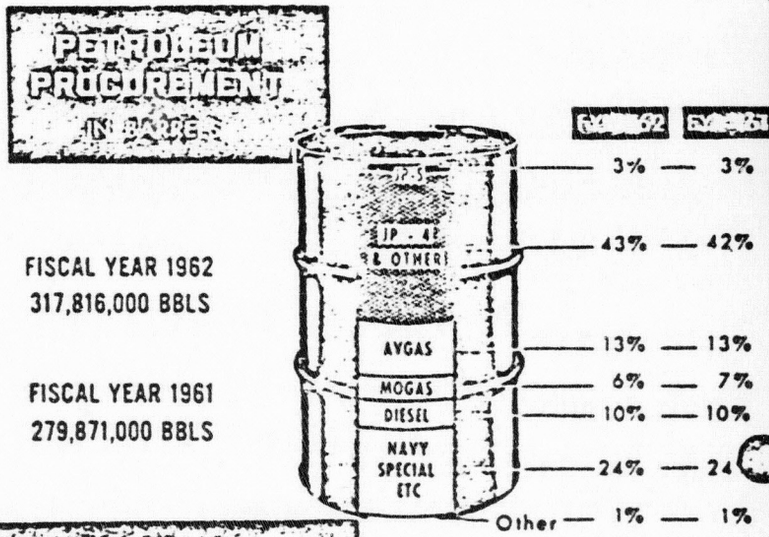
As mentioned earlier, our scope of operations, unlike other Commodity Centers, carries us beyond the tidewaters of the United States. In carrying out these responsibilities, unique to the commodity of petroleum, we have petroleum organizations overseas to assist us. These organizations are called Joint Petroleum Offices, and were established by the Joint Chiefs of Staff because of the vital importance of insuring POL logistical support to the Unified Commanders. The officers on the Staff of each Unified Commander provide logistical support planning, and direct operations pertaining to petroleum for support of the theater mission. The Offices are jointly staffed by members of the four Military Services. They act as the ordering Agency in placing demands on DPSC for petroleum products developed by the Component Commanders and consolidated by the Unified Commander to meet the operating and war reserves required for support of Military Forces in the overseas areas.

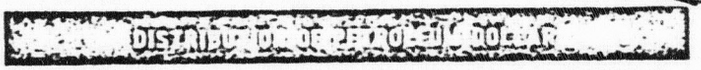
In summary, the petroleum supply chain from initial determination of requirements to final delivery into ships, aircraft, tanks and trucks around the globe contains many organizational links. The strength of this petroleum supply chain has been crises tested. Its toughness and flexibility are attributable to the United efforts of the men and women in the Government organizations and the petroleum industry.

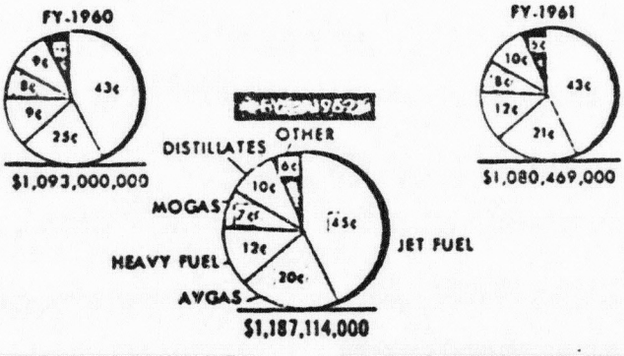

THE PRESIDENT OF THE UNITED STATES
NATIONAL SECURITY COUNCIL
OFFICE OF EMERGENCY PLANNING
GENERAL SERVICES ADMINISTRATION
SECRETARY OF THE INTERIOR
SECRETARY OF DEFENSE
SECRETARY OF STATE
OFFICE OF OIL & GAS
NATIONAL PETROLEUM COUNCIL
OIL IMPORT ADMINISTRATION
BUREAU OF MINES
FOREIGN PETROLEUM SUPPLY COMMITTEE
OFFICE OF INTERNATIONAL TRADE & RESOURCES
INTERNATIONAL COOPERATION ADMINISTRATION
FUELS DIVISION
PETROLEUM BRANCH

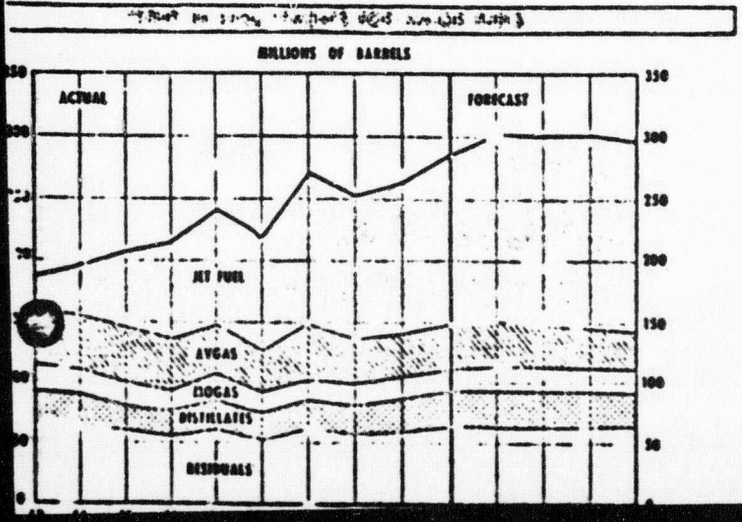

DEFENSE PETROLEUM SUPPLY CENTER
E 1224


WEST COAST
EAST COAST
PERSIAN GULF
OFFSHORE 401
SHUTTLES 339
MISC. 33
TOTAL 773


PETROLEUM PROCUREMENT
FISCAL YEAR 1962
317,816,000 BBLS
FISCAL YEAR 1961
279,871,000 BBLS
JP - 4 & OTHER
AVGAS
MOGAS
DIESEL
NAVY SPECIAL ETC
Other
3% — 3%
43% — 42%
13% — 13%
6% — 7%
10% — 10%
24% — 24
1% — 1%




FY-1960
$1,093,000,000
FY-1961
$1,080,469,000
DISTILLATES
OTHER
MOGAS
JET FUEL
HEAVY FUEL
AVGAS
$1,187,114,000


MILLIONS OF BARRELS
ACTUAL
FORECAST
JET FUEL
AVGAS
MOGAS
DISTILLATES
RESIDUALS



PROCUREMENT OF PRODUCTS

by

Captain O. W. Stafford, SC, USN

E 1225

Our basic tool for supplying petroleum product to the Armed Forces is what we call an open-end contract. Simply stated an open-end contract is a document which permits the using activities within the Services to order directly from the contractors what they need when they need it. The Military Services give DPSC the estimated quantities and using locations and these in turn form the basis for awarding the open-end contracts.

For purposes of discussion, our procurement effort is divided into two parts: Domestic and Overseas. First, we will discuss domestic procurement.

Insofar as practicable, we take advantage of the vast commercial distribution system for petroleum product that exists in the United States. One of the documents we use for this purpose is called a post-camp-and-station contract. This contract permits the using activity, large or small, to order its motor gasoline, diesel oil, kerosene, and heating oil from a local source of supply as the need arises. A similar arrangement is in effect for supplying lubricating oils and greases.

We are obliged to use a different system of supply for our ships and planes. Although some features of the post-camp-and-station arrangement are retained, the supplying of ships and planes is largely accomplished through centralized ordering within the Services for delivery to government-owned or government-controlled terminals.

Navy Special, as many of you know, is the fuel oil for our ships. It is a specification product made especially for us. At the seaports where we have no facilities for refueling ships, we contract for Navy Special delivered into our vessels. However, the bulk of Navy Special is bought for government-owned coastal terminals. We have an annual import quota of about one and one-quarter million barrels of black product and we apply Navy Special against this quota.

Turning now to aviation requirements we have three principal aviation fuels: JP-4 jet fuel used almost exclusively by the Air Force; JP-5 used by the Navy, and 115/145 aviation gasoline used by all the Services. To give you some conception of the procurement and distribution pattern I have selected JP-4 for comment. Any one of the three fuels would serve but JP-4 has more of an appeal because of the volume and because of the industry-wide interest in this product.

We buy JP-4 for domestic use twice a year by means of advertised procurement. The volume is tremendous by any standards: the last two procurements have each been for about 55 million barrels of product. In these days of millions and billions we tend to lose our perspective. In terms of tank cars, our semi-annual procurement of 55 million barrels of JP-4 would form a train reaching from Washington D.C. to Chicago.

The requirements pattern for JP-4 calls for delivery to ocean terminals, barge terminals, pipeline terminals and for other large volume locations as well as to the smaller installations. The Services submit requisitions in June and

December of each year and DPSC makes contracts for six months periods, April through September and October through March. We have an annual import quota of clean product of about 12 million barrels and we apply JP-4 against this quota.

Now let us look at our overseas procurement. In other presentations you have been told that our annual volume of procurement is in excess of one billion dollars. About three hundred million of this is for overseas procurement. Overseas procurement is defined as procurement from an overseas source of supply; however, it should be emphasized that the majority of these procurements are from American firms doing business abroad.

The source of supply for our forces overseas are the Caribbean, the Near East, local sources within the foreign countries themselves and in the case of aviation gasoline the United States.

Let us consider the various areas of the world requiring petroleum support. First, the European Area comprising the United Kingdom, France, Germany and Spain. In Great Britain there is a British-owned pipeline extending throughout the country where most of our bases are located and product is delivered through this line. Contract coverage has been arranged for those bases that cannot be served by the pipeline.

Our forces in France and Germany are supplied by a U.S. operated pipeline extending from Donges, near Saint Nazaire on the Atlantic Coast of France, to Germany. As in Great Britain, those locations that cannot be supported by the pipeline are serviced by other means.

The United States Forces in Spain also receive their product by U.S. operated pipeline. The terminal for this line is at Rota near Cadiz on the Atlantic Coast of Spain.

In the Mediterranean Area we have forces in the interior of Italy, Greece and Turkey and the SIXTH fleet is based at Naples. The bases are supplied by local delivery within those countries and to a limited extent from refineries in the Near East. A long-term contract for Navy Special and JP-5 with an American refiner in Italy meets the needs of the U.S. SIXTH Fleet in the Mediterranean.

Turning now to the Far Pacific, our forces in that area of the world are supplied from refineries in the Near East. The requirements for our Army in Korea for the SEVENTH Fleet in Formosa Straits and for the U.S. Air Force in the Far Pacific are satisfied largely through deliveries of product to storage locations in Japan, the Philippines, Okinawa, Guam, etc.

We have covered most of the areas of the world except our military installations North of the U.S. border. Those located in the interior of Canada are serviced principally by Canadian firms on a post-camp-and-station basis. Requirements for Labrador, Newfoundland, Greenland and Iceland come almost entirely from the Caribbean.

There are two additional types of contract coverage quite essential to our needs that I have not mentioned. One of these is the into-plane contract. This is merely another name for refueling service at commercial airports throughout

the world for U.S. government planes, either civilian or military. These contracts will be found in far away places such as Addis Ababa in Ethopia or Christchurch in New Zealand. We also have what we call world-wide bunkering contracts. These are the surface ship counterparts of the into-plane contracts. Everywhere that U.S. Navy ships or MSTS ships are likely to go we have anticipated their fuel requirements with a contract which enables them to be refueled and serviced.

This in brief is how DPSC furnishes petroleum support to the U.S. Armed Forces.

PROCUREMENT OF SERVICES

E 1228

by

Colonel S. O. Benner, USAF

I. INTRODUCTION

In addition to buying petroleum products described by Capt. Stafford, the Defense Petroleum Supply Center buys services connected with petroleum. We procure these services on behalf of the Army, Navy, and Air Force, and we let contracts throughout the world. We presently are administering some 140 contracts: (flash slide 1) the chart shows the concentration of the 118 contracts we have in the States. I'll show you the overseas locations later.

Our buying programs cover several different types of services. They include the operation of government-owned terminals; commercial storage services; drum and container filling; laboratory testing; re-refining; aircraft refueling; and miscellaneous services, such as the blending of anti-icing additive into government-owned jet fuel.

Many of you presently have service contracts with the center and are providing the Military with excellent services. Many of you are potential suppliers. In some of our programs there isn't much competition. I would like to describe the services involved in each program in hope of developing more industry interest.

II. GOVERNMENT-OWNED TERMINALS

(Flash slide 2) one of our programs is for the operation of bulk storage terminals owned by the Air Force. The contracts under this program are usually for 12 months, but with the starting dates staggered throughout the year. The contracts are let by formal advertising and are reserved for small business. We presently contract for the operation of 10 of these terminals, as shown on the chart. The terminals range in size from 100,000 barrels at Tacoma, Washington, to 1,200,000 barrels at Tiverton, Rhode Island.

In operating these terminals, the contractor performs all the services incident to receiving, storing, and shipping government-owned fuel, plus everyday housekeeping and maintenance of the facility itself. Except for the small tools required in maintenance, little fixed investment is necessary. Basically, the contractor provides the personnel necessary for all terminal operations. This might include only a terminal superintendent, several operators, and a guard.

For the operation of all 10 terminals, the government pays some $600,000 a year. At present, we have 47 companies on our mailing list for this program; but many are not active bidders. All of the contracts are presently divided among only 4 companies.

III. COMMERCIAL TERMINALS

A second buying program in the service contracts division is for storage

services in commercially-owned bulk terminals. (flash slide 3) This chart shows the location of the eleven commercial terminals contracted for on behalf of the Navy. (flash chart 4) the dots on this chart represent the 24 single year storage contracts for the Air Force; on a later chart six terminals for the Army will be shown..

Under many of these commercial storage contracts, the government uses only one or two storage tanks, while under others we occupy the whole terminal. The government is quite flexible as to the specifications of tanks provided under commercial storage contracts.

In furnishing storage services, the contractor provides the required storage, and also handles the government-owned product as it enters and leaves the terminal. Terminal personnel are required to operate the storage being used by the government in much the same manner as the operations required in the government-owned terminals I mentioned earlier.

We let these contracts by negotiation, and any company, large or small, may participate. Prices vary considerably, depending on the size and location of the terminal, the complexity of its operation, ancillary operations, and the competition available in the area.

Though these contracts are initially let for just a 12 month period, most contain unilateral government options to renew the services for several succeeding one year periods. The procurement regulations prohibit contracts of this type for more than one year's duration.

Competition in this program is restricted geographically, since the Military service requiring the storage specified the area in which the terminal must be located. Often there is good competition; often not. At one location I visited recently nearly a dozen different companies had existing storage available. In many areas, however, we have had to look hard for suppliers.

There are presently 28 companies providing single year commercial storage services for the government. Though there are over 100 firms on our mailing lists for all locations, in most areas the likely suppliers are very few.

Most of our single year commercial storage contracts are for the use of existing storage. Occasionally, however, we have a requirement in an area where there is not sufficient existing storage. Then, in order for the contractor to perform the services necessary in providing storage for the government, he must first build the tanks. Although the contract calls for storage services only, we recognize in the negotiations the contractor's costs of construction. Of our 41 single year commercial storage contracts, 6 have some element of construction costs included in their service charges.

IV. MULTI-YEAR COMMERCIAL STORAGE

We have eight multi-year commercial storage contracts. These are the result of requirements for storage in areas where there was no existing storage and where no commercial requirements for petroleum storage were foreseen. Because of the

poor prospects for future commercial business, industry was reluctant to build terminals with only a one year guarantee of government use. On the other hand, the government did not desire to bear the entire construction cost in one year. Consequently, we secured legislation permitting firm contracts up to 5 years, provided the storage facility to be constructed met certain criteria on dispersal and hardening.

As shown on the chart, marked by diamonds, main across the Canadian border, there are 8 of these contracts presently in operation. The 8 terminals range in size from 90,000 barrels to 1,000,000 barrels. At present we know of no new requirements for services of this type.

V. DRUMMING

(Flash slide 5) The dots on this chart show the commercial storage sites for the Army. As indicated by the "D's", at some of these sites, there is also provided drumming and can filling services. We have 10 drumming contracts: 8 for the Army and 2 for the Air Force. The contracts are for one-year, usually, with government options to renew for several succeeding years.

In drumming, the services performed by the contractor include receiving and inspecting empty drums or cans, storing empty drums, filling drums with government product, storing the filled drums, and loading them aboard government-furnished transportation. The contracts usually provide for the government to pay for each of these services separately.

For instance, for each drum handled we might pay to receive it, so much a month to store it, and so much to fill it and load it for shipment.

Eight companies presently are providing these services for the government. Although more than 70 firms have indicated an interest in this program and are on our mailing lists, geographic factors sometimes result in little competition in some areas. In general, drumming is desired in coastal locations.

VI. LABORATORY TESTING

(Flash slide 6) We also procure laboratory testing services at commercially-owned labs for the Air Force. As indicated by the chart, we presently have contracts in the U.S. at 20 labs. These contracts are very small monetarily. They are let once a year by formal advertising.

Under these contracts, the labs perform all sorts of tests and sample analyses on government petroleum products. Some contracts provide for as many as 40 different tests. The contractor is paid for each test performed.

16 different firms presently have lab service contracts with the center. These firms vary in size from small single proprietorships to the major oil companies. Our invitations for bids are mailed to 87 companies. Even with this number of interested firms, we have trouble every year getting adequate responses to the testing IFB. This year we were unable to get lab services at 5 locations.

E 1231

RE-REFINING

A very small program is for the re-refining of government-owned used aircraft engine oil. This is primarily an Air Force program. The contracts are let by formal advertising and are re-advertised yearly. Under these contracts, the contractor re-refines used aircraft engine oil to produce grade 1100 lube oil. The services required of the contractor all take place at his refinery. There he receives used oil from government transportation, stores it in bulk storage tanks, and later re-refines it for distribution back into government petroleum stocks. We presently have only 3 contracts for these services as shown on the chart by the dots Of the 25 known suppliers of this service, only 5 are active bidders. We would especially like to interest other companies since the Air Force's re-refining requirements, like the lab ones, are never completely met.

VII. AIRCRAFT REFUELING

(Flash slide 7) Still another of the services we contract for is aircraft refueling for the Navy. As shown on the chart, there are 25 Naval air stations across the country which have private industry refueling its aircraft. These contracts are generally for a 12 month period, although we stagger awards throughout the year. These contracts are totally reserved for small business. They are let by formal advertising.

The contracts call for the contractor, using its own tank trucks and personnel, to fill its trucks at the station fuel depot, transport the government fuel alongside the aircraft in the refueling areas, and, as required, to defuel aircraft, all as directed by the station commanding officer. This is a 24 hour a day, 7 day a week operation. The contractor is paid basically by the month for these services. Presently, there are about 16 companies actively bidding for contracts in the program. All 25 contracts are held by 10 companies. In some locations there is still little competition.

VIII. OVERSEAS

(Flash slide 8) We also have 22 contracts for services to be performed overseas, as shown on the chart. The services provided by these contracts are mostly of the same types as those performed in the States; that is: commercial storage, drumming, and laboratory testing. The contracts are let through negotiation.

Some of the overseas contracts are unusual. For example, we presently have several contracts calling for the injection of anti-icing additive into existing stocks of Air Force jet fuel.

Under these contracts, the contractor provides the additive, men, and machinery necessary to inject a specified amount of additive into the fuel.

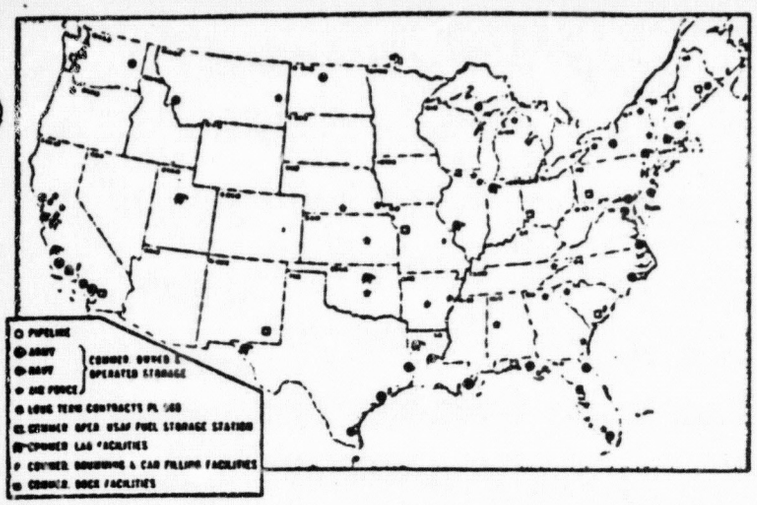
CONCLUSION

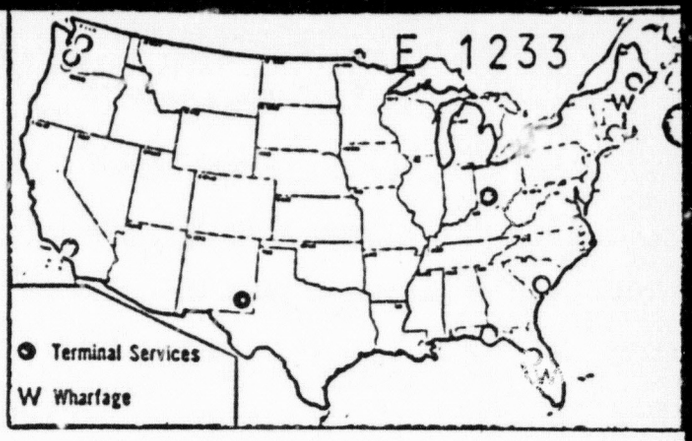
I should point out that our goal is to provide the armed forces with good

petroleum services at low cost. We've found that the best method of doing this is through competition. We welcome proposals from companies having a capability to perform any of the services I've described. The Army, Navy, and Air Force develop their own requirements. We will be glad to sound them out on any proposal from any company. We welcome letters of inquiry or visits to our offices on any matter concerning these programs. Many firms which began doing business with us in only one program are now participating in 3 or 4.

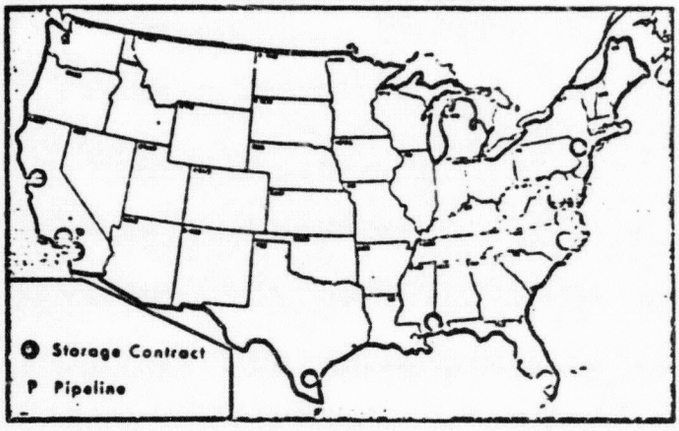
So, if your company is doing business with us now, make sure you're receiving solicitations for all our programs you are interested in. If you're not doing business with us or drop in for more information on our programs and to get on our bidder's mailing list.

E 1233

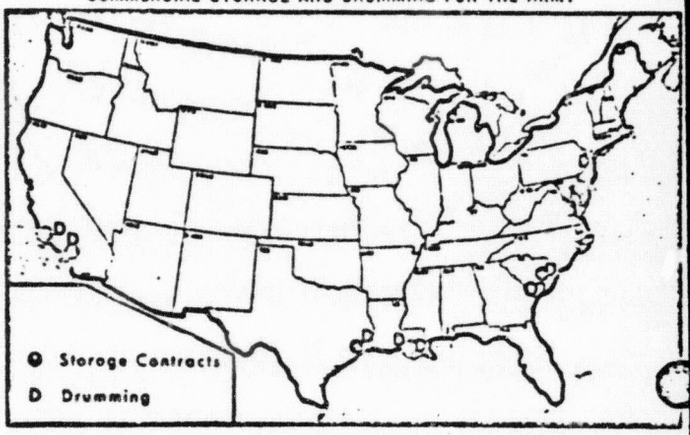




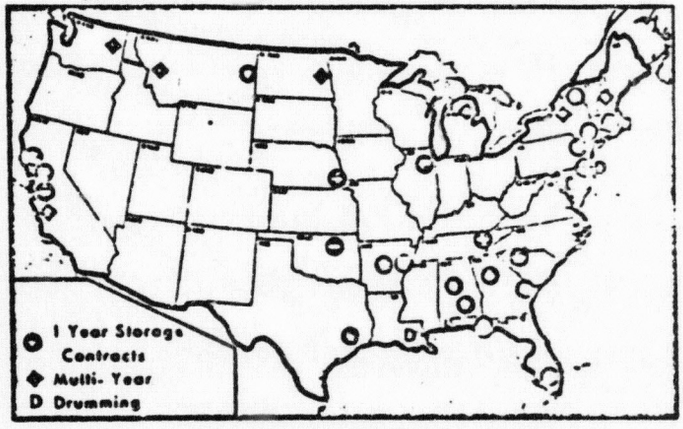
COMMERCIAL STORAGE FOR THE NAVY



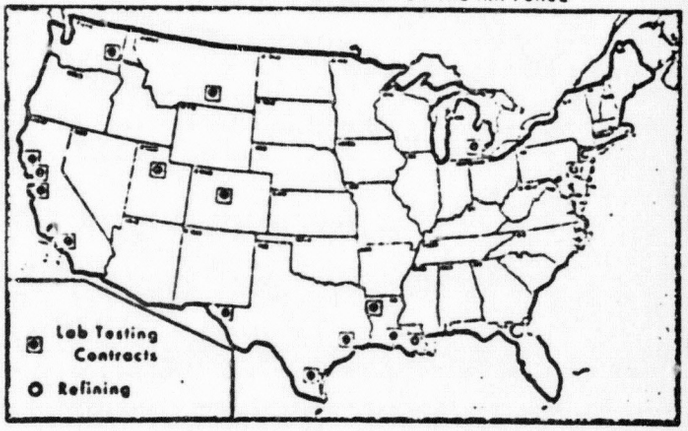
COMMERCIAL STORAGE AND DRUMMING FOR THE ARMY



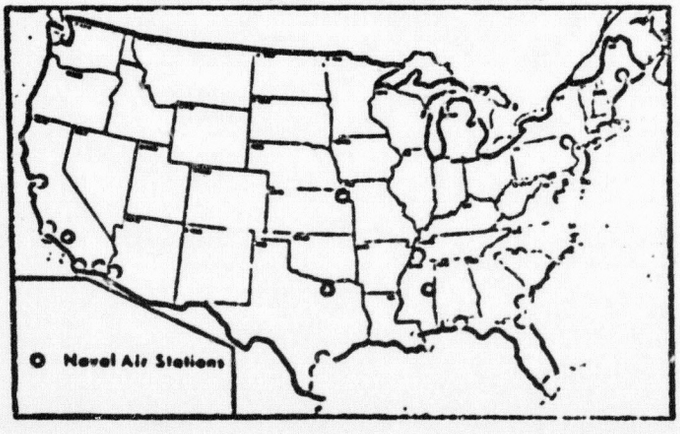
COMMERCIAL STORAGE AND DRUMMING FOR THE AIR FORCE



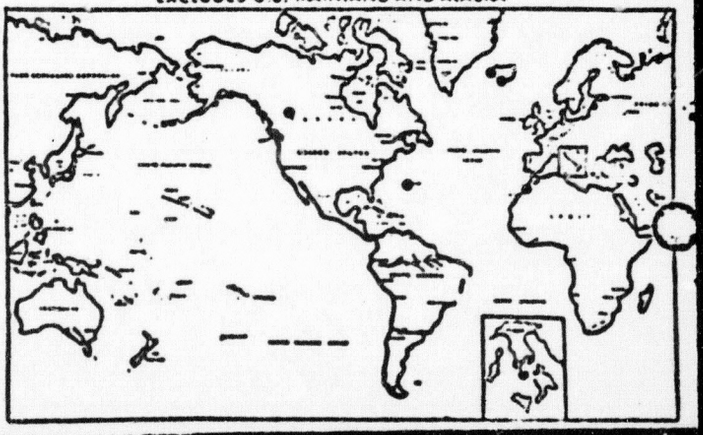
LAB TESTING AND RE-REFINING FOR THE AIR FORCE



AIRCRAFT REFUELING AT NAVAL AIR STATIONS



SERVICE CONTRACTS - WORLD-WIDE
EXCLUDES U.S. MAINLAND AND ALASKA



LEGAL ASPECTS OF DPSC CONTRACTS

by

C. F. Pollock

E 1234

I will briefly discuss two subjects: the first being the Comptroller General's decision of last November concerning the small business set-aside program in jet fuel procurement: the second being the long range impact of government's contract terms upon industry standards.

I had hoped to be able to also comment on the nondiscrimination clause of our contracts and on the results of the compliance reports which your firms have submitted to the president's committee on equal employment opportunity. However, I must advise that I have been unable to develop sufficient information to discuss the matter today.

SMALL BUSINESS

Last November 17th, in response to a formal protest, the Comptroller General rendered an opinion as to the legality of certain aspects of our small business set-aside procedures for jet fuel procurement.

The Comptroller General considered three basic questions: First, whether partial set-asides were legally authorized by Congress. Second, whether the set-aside awards made by the Defense Petroleum Supply Center in the particular instance involved in the protest, resulted in higher prices than were otherwise available on the formally advertised portion of the procurement: and, if so, the propriety of such awards; and third, whether the "floating set-aside" principal was legally authorized.

The Comptroller General answered the three questions as follows:

On the first question, which was whether or not partial set-asides were legal, the Comptroller General said that the "Congress, by enacting section 15 of the small business act, has authorized the negotiation of partial set-asides for small business subsequent to the unrestricted formally advertised portion of a procurement." Hence, he confirmed his previous decisions and held that partial set-asides were legally authorized by the congress.

To the second question, the Comptroller General devoted 8 pages of his opinion. It is difficult to concisely brief that much material and not run afoul of possible different interpretations which some of you may have already made. So, please forgive me for slight differences which may be occasioned only by my efforts to be brief.

The second question was whether the specific set-asides in issue were awarded at prices higher than otherwise available, and, if so, the propriety of such awards.

Basically the Comptroller General held that the formula being used by DPSC in determining set-aside award prices was in accordance with past Comptroller General decisions and in conformity with authority granted to DPSC by the department

of Defense. He said, "we do not object to the formula...so long as the total cost... would not exceed what it would have been absent a set-aside." However, although he did not object to the formula used, in this case he found that the specific awards were not computed in strict accordence with the formula and that "the price at which awards were made... is in excess of the price agreed to be paid," ...on the nonset-aside portion, and, in his opinion "a downward adjustment in price with ...the two concerns awarded the set-aside "would be appropriate." In other words, he did not question the formula for determining set-aside prices but he did question the propriety of the prices in that particular instance because he felt that the formula had technically not been properly applied.

It is unlikely that the same factual situation will again occur under the new set-aside procedures now being used by the defense petroleum supply center.

The third question, you will recall, was whether the "floating set-aside" principle was legally authorized. On that third question, the Comptroller General said that the "floating set-aside" violated the rules of formal advertisement in that it did not define, with sufficient certainty, the quantities available under each item for formal competitive bidding. Further, the Comptroller felt that DPSC had used the "floating set-aside" long enough to have acquired needed information on where and how large to make specific set-asides on an item by item basis.

As a result, the DPSC now uses an entirely different structure in designating set-asides. We now designate a certain quantity of various items as set-aside for small business. Hence on each item, the nonrestricted portion and the set-aside, or restricted, protion are fixed at the time the solicitation is forwarded to industry.

You will recall that our jet fuel solicitation each six months had been running in the neighborhood of 40 to 44 million barrels and that approximately 4 to 6 million barrels was set-aside. Actual awards to small business under the set-aside had been approximately 4 to 5 million barrels. And the total of the nonrestricted set-aside awards to small business was approximately 9 to 10 million barrels.

It is difficult to compare results under the new set-aside procedures with results under the old floating set-aside because our procurement requirements for jet fuel have increased and are now approximately 50 to 55 million barrels each six month. Under the new procedures we have found it necessary to increase the total quantity set-aside for small business from approximately 6 million to 11 million barrels. Of the 11 million barrel set-aside, small business has accepted set-aside awards of approximately 8 million. This is a considerable increase over the 4 to 5 million awarded under the former floating set-aside. However, this increase reflects only a change in the pattern of awards and not an actual increase in overall awards to small business because the total of all jet fuel awards to small business remains at 9 to 10 million barrels. The pattern has changed in that the amount awarded on the nonset-aside portion has decreased and the amount awarded on the set-aside portion has increased a like amount with the result that the total awards of jet fuel to small business have remained essentially the same.

Notwithstanding that it has been necessary to increase the quantity set

aside to retain the same proportion of awards to small business, and, notwithstanding that the new procedure has placed an additional administrative workload on DPSC, all present indications are that the general purpose and intent of the small business act are being as well carried out under the new procedure as was originally successfully developed under the floating set-aside procedure.

IMPACT ON CONTRACT TERMS

The second item I would like to discuss is the impact of the terms of our contracts upon industry.

You are familiar with the impact which government specifications have on the type and quality of commercial product and on industry standards in general. Government specifications in time tend to become industry standards. For the most part, this has been good for the industry when considered collectively. However, with the passage of time, individual companies within the industry have found it advisable to specifically interest themselves in the continuing development of government specifications.

The point I wish to make is that what is true of government specifications is, or should, also be true of government's contract terms. We must, of course, recognize that many of our contract terms are not within your and my province to amend. Those clauses which are required by statute and executive order are essentially sacrosanct and must be included in our contracts whether or not we like them or need them. There are, however, a number of clauses which are within our authority to amend: such as those concerning delivery, inspection, acceptance and invoicing.

About five years ago, we undertook a careful study of our supply contract general provisions. The revised provisions were incorporated into a new form designated, MPSA form 77. Our plan has been to revise this form each year. To date, we have been successful in doing so.

From what I hear, the industry is accepting, as its standards, some of the terms expressed in our government contracts. I think this trend will continue because our contracts touch nearly everyone in the industry and, hence, become common ground concepts within industry. Basically, this is good. However, although these concepts can be adjusted fairly easily in their early stages: time will make them ever more difficult to amend.

I am suggesting that you and your industry have a long term stake in our contract terms. I'm sure each of you know of marketing practices to which your company is now committed that you would gladly scrap. I've even heard some of you say you would like to hang first, and then try, the fellow who came up with the idea of credit cards.

Yet, the same thing can be happening with respect to the concepts embodied in our contract general provisions. Tanker deliveries provide a case in point. Our contracts provide that, on delivery F.O.B. a tanker, the title will pass at the ship's permanent hose connection but that measurement for quantity will be

at the suppliers' shore tanks and that inspection may be at still another point. In other words, "delivery" involves three different locations and three different points in time. What happens if there is a pipeline break between the shore tank and the ship's permanent hose connection? Could we, as a practical matter, designate one point for acceptance, measurement and passage of title? If we can, should we?

These questions and many, many others are involved in our contract general provisions. The answers we adopt have a long range impact on the industry. How can you and we get at the problem?

My suggestion is that you or members of your companies carefully and periodically review our contract terms and, from time to time, forward to us your comments and recommendations. I cannot guarantee that we will adopt any of your recommendations. It is even probable that industry comments, on any given concept, will vary from all black to all white. Naturally, we intend to adopt only that which is in the best interests of the government. However, there is a large area of common interest, and, the ideas you express on one subject may plant the seed of solution to that problem or to a problem on another subject. Without an expression of industry opinion we navigate to some extent in the dark.

In any event, I want you to understand that the Defense Petroleum Supply Center encourages industry comments on our contract provisions and that all comments will be carefully considered. One note of caution: the time to comment is before or after you submit a bid. We frown on comments submitted with your bids, and, as many of you may have regretfully learned, we are required to reject such bids as nonresponsive.

E 1238

CHAPTER V

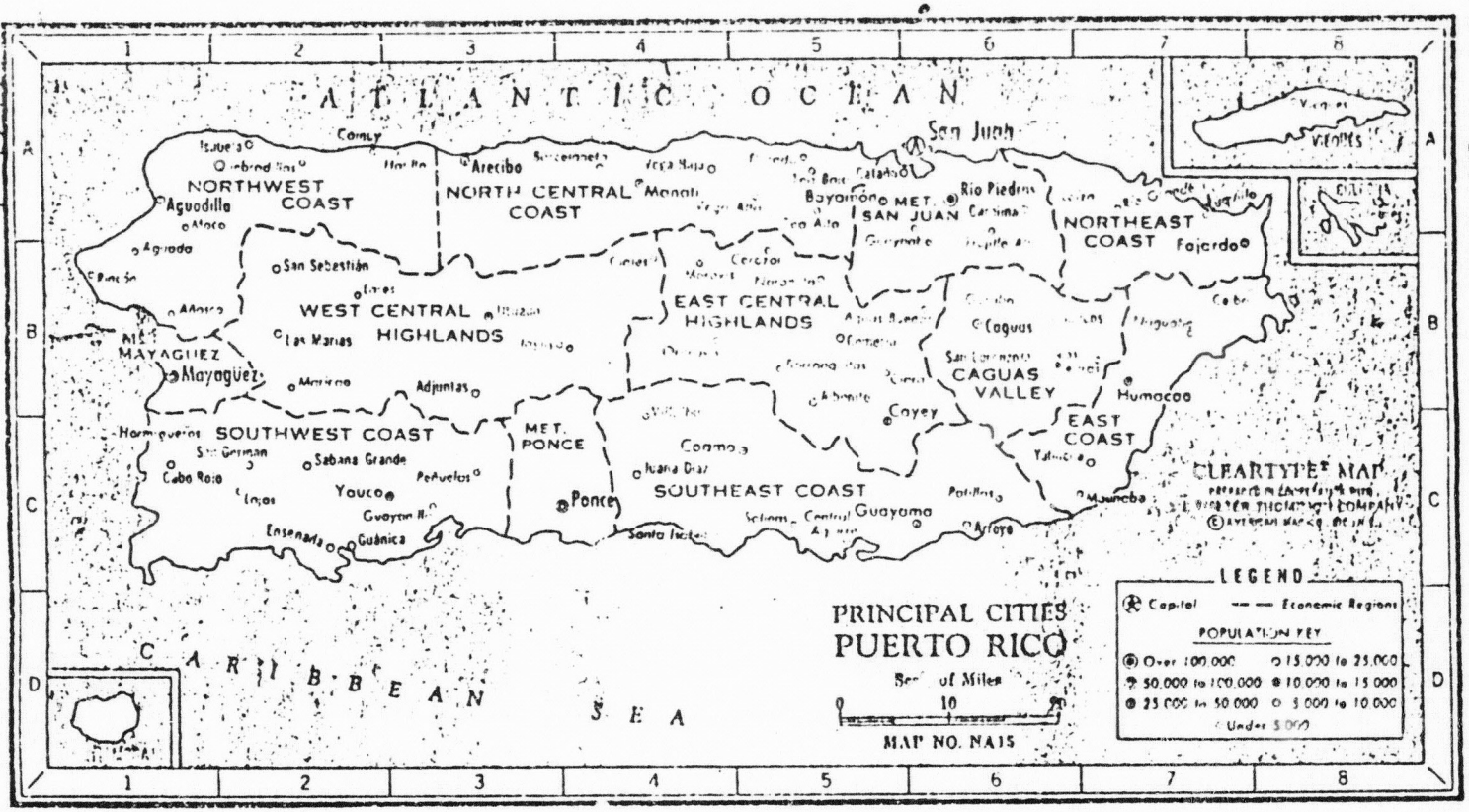
ENGINEERING PLANNING

Engineering planning has been directed toward a practical compromise between a standard refinery and refinery designed to produce a maximum of petrochemical products for which there is little or no present market. The compromise results in a core plant to produce petrochemical feed stocks at the maximum rate they can be marketed. Further, however, is the key that this plant must be designed so that additional petrochemicals can be withdrawn in the future and that the company is committed to providing these additional petrochemicals or feed stocks.

Two studies and an addendum to the second study have been made by the Universal Oil Products Company for the proposed core plant. The plant covered by the second study with addendum produces approximately 18% of the dollar sales volume in petrochemicals. By adding a sulfur recovery unit and a tetraethyl lead antiknock additive plant, the petrochemical sales will increase to approximately 20%.

The study covers a 60,000 bbl/day refinery designed to produce a maximum practical quantity of petrochemical raw materials and intermediates. It includes capital and operating cost estimates, manpower requirements, process description, yields, estimated net operating income, and a site survey.

E 1239



ECONOMIC REGIONS

(14 Regions)

Name of region followed by population in thousands, to nearest thousand, then location on map

Caguas Valley, 141 — B 6
East Central Highlands, 206 — B 4
East Coast, 105 — C 7
Met. Mayaguez, 87 — B 1
Met. Ponce, 127 — C 3
Met. San Juan, 509 — A 5
North Central Coast, [illegible]
Northwest Coast, 198 — A 2
Southeast Coast, 171 — C 4
Southwest Coast, 180 — C 2
West Central Highlands, 187 — B 3
Vieques Island, 9 — A 8
Culebra Island, 1 — A 8

Total PUERTO RICO 2,229.

CITIES

Name of city followed by population in thousands to nearest thousand, then location on map.

Adjuntas, 5 — B 3
Aguada, 3 — B 1
Aguadilla, 5 — B 2
Aguas Buenas, 3 — C 5
Aguada, 5 — B 1
Arecibo, [illegible] — A 3
Arroyo, 5 — C 6
Barceloneta, 1 — A 5
Barranquitas, [illegible] — B 5
Bayamon, 25 — A 5
Cabo Rojo, 5 — C 1
Caguas, 34 — B 6
Camuy, 2 — A 2
Carolina, [illegible] — A 6
Catano, 9 — A 5
Cayey, 19 — C 5
Ceiba, 1 — B 8
Central Aguirre, 3 — C 5
Ciales, 3 — B 4
Cidra, 3 — C 5
Coamo, 12 — C 5
Comerio, 5 — B 5
Corozal, 1 — A 5
Culebra, 1 — A 8
Dorado, 3 — A 5
Fajardo, 5 — C 2
Florida, 15 — B 7
Guanica, 2 — C 2
Guayama, [illegible] — C 6
Guayanilla, 2 — C 3
Guaynabo, 4 — A 6
Hatillo, 2 — A 3
Hormigueros, 1 — C 1
Humacao, 11 — B 7
Isabela, 2 — A 2
Jayuya, 2 — B 4
Juana Diaz, 5 — C 4
Juncos, 8 — B 6
Lajas, 1 — C 2
Lares, 4 — B 2
Las Marias, 5 — B 2
Loiza, 3 — A 6
Luquillo, 2 — A 7
Manati, 10 — A 4
Maricao, 3 — B 2
Maunabo, 1 — C 7
Mayaguez, 59 — B 1
Moca, 1 — A 1
Morovis, 2 — B 4
Naguabo, 4 — B 7
Naranjito, 2 — B 5
Orocovis, 3 — B 4
Patillas, 2 — C 6
Penuelas, 2 — C 3
Ponce, 99 — C 4
Quebradillas, 2 — A 2
Rincon, 1 — B 1
Rio Grande, 3 — A 7
Rio Piedras, 132 — A 6
Sabana Grande, 5 — C 2
San German, 9 — C 2
San Juan, 225 — A 6
San Lorenzo, 7 — B 6
San Sebastian, 5 — B 2
Santa Isabel, 4 — C 4
Toa Alta, 1 — A 5
Toa Baja, 1 — A 5
Trujillo Alto, 1 — A 6
Utuado, 10 — B 3
Vega Alta, 3 — A 5
Vega Baja, 5 — A 4
Vieques, 3 — A 8
Villalba, 1 — B 4
Yabucoa, 5 — C 7
Yauco, 10 — C 3

E 1239

The details of the U.O.P. studies are included in Appendix B. E 1240

The general area of the site is shown in red on the map opposite. Further details of their site are shown on pages 45-47 of Appendix C.

# # #

CHAPTER VI

ECONOMIC DATA AND FINANCING PLAN

The financial advisors to the PUERTO RICO OIL AND PETROCHEMICAL CO. have developed the following plan for financing the core plant.

This plan is an extension of the cost estimates from the study carried out by the UNIVERSAL OIL PRODUCTS CO., and includes additional financing for operating capital, including overhead and sales expenses, and contingencies to cover start-up expenses and unforseen delays in reaching a profitable rate of production. This contingency fund is approximately 20% more than the estimated costs shown in the UNIVERSAL OIL PRODUCTS study attached hereto, entitled PROCESSING AND ECONOMIC DATA FOR A PROPOSED PUERTO RICO REFINERY+SECTION 3+SUMMARY.

As shown in TABLE I, the total capital investment is estimated at $68,485,590 of which 80% is to be provided through Sinking Fund Debentures and 20% is to be provided through equity capital. In addition, the plant site is to be provided by the Commonwealth, and leased to the company. The area development is to be carried out by the Commonwealth.

To the estimated sum of $68,485,590, the company has added a sum of approximately 15% for operating capital, and unforseen expenses, bringing the total to $79,000,000.

The calculation in TABLE I of Net Operating Cost and Income is a proforma presentation, and flexibility exists under the tax laws of the Commonwealth to permit full depreciation before any taxes are due. Other more favorable handling of debt burden could be anticipated as the situation requires. However, the plan as shown is feasible, and should suffice.

The UNIVERSAL OIL PRODUCTS financial study is fully adequate in the opinion of the financial advisors to the company.

Stability is added to this plan by virtue of the marketing contract between the company and PHILLIPS PETROLEUM COMPANY, which assures the sales of the available product from the core plant.

This financial plan will be implemented through an S.E.C. Prospectus as soon as an oil import permit is issued to the company. The body of this Report, together with the financial plan, is substantially the material which will constitute the S.E.C. Prospectus.

Following is the report by the UNIVERSAL OIL PRODUCTS CO.

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B. JACOBS 2/7 ID 72

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE I

ESTIMATED NET OPERATING INCOME

Year	Product Value	Charge Value	Gross Profit	Operating Expenses	Net Profit	Sinking Fund Debent.	Debent. Interest 6%	Income Before Deprec.	Deprec.	Balance Before Taxes	Income Taxes	Income After Taxes	Earnings on Equity (a)	Earnings on Equity (b)
1	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	3,287.3	12,797.6	3,131.7	9,665.9	-	9,665.9	6,426.5	10,066.2
2	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	3,122.9	12,562.0	3,131.7	9,830.3	-	9,830.3	7,090.9	10,222.6
3	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	2,958.6	13,126.3	3,131.7	9,994.6	-	9,994.6	7,255.2	10,386.9
4	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	2,794.2	13,290.7	3,131.7	10,159.0	-	10,159.0	7,419.6	10,551.3
5	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	2,629.8	13,455.1	3,131.7	10,323.4	-	10,323.4	7,584.0	10,715.7
6	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	2,465.5	13,619.4	3,131.7	10,487.7	-	10,487.7	7,748.3	10,880.0
7	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	2,301.1	13,783.8	3,131.7	10,652.1	-	10,652.1	7,912.7	11,044.4
8	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	2,136.8	13,948.1	3,131.7	10,816.4	-	10,816.4	8,077.0	11,208.7
9	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	1,972.4	14,112.5	3,131.7	10,980.8	-	10,980.8	8,241.4	11,373.1
10	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	1,808.0	14,276.9	3,131.7	11,145.2	-	11,145.2	8,405.8	11,537.5
11	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	1,643.7	14,441.2	3,057.0	11,384.2	4,170.6	7,213.6	4,474.2	7,331.2
12	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	1,479.3	14,605.6	3,057.0	11,548.6	4,231.0	7,317.6	4,538.2	7,635.2
13	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	1,314.9	14,770.0	3,057.0	11,713.0	4,291.4	7,421.6	4,602.2	7,739.2
14	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	1,150.6	14,934.3	3,057.0	11,877.3	4,351.9	7,525.5	4,726.1	7,843.1
15	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	986.2	15,098.7	3,057.0	12,041.7	4,412.2	7,629.5	4,850.1	7,947.1
16	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	821.8	15,263.1	927.0	14,336.1	5,255.4	9,080.7	6,341.3	7,268.3
17	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	657.5	15,427.4	927.0	14,500.4	5,315.8	9,184.6	6,445.2	7,372.2
18	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	493.1	15,591.8	927.0	14,664.8	5,376.2	9,288.6	6,549.2	7,476.2
19	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	328.7	15,756.2	927.0	14,829.2	5,436.5	9,392.6	6,653.2	7,580.2
20	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	164.4	15,920.5	927.0	14,993.5	5,497.0	9,496.5	6,758.1	7,685.1

Notes:

(a) Total capital investment $68,445,590
20% Equity Capital $13,697,118
80% Convertible Sinking Fund $54,748,472
Debentures, 6% interest, 20 years

(b) Yearly sinking fund, 1/20 of $54,748,472 = $2,739,424 paid at the end of each year out of income after taxes.

(c) Debenture interest, 6% on the unpaid debentures.

(d) Earnings on equity: Net income after payment of the yearly sinking fund.
Gross income after payment of the yearly sinking fund plus depreciation.

(e) Depreciable items: Process and offsites facilities and startup capital.

(f) Depreciation rate: Process Capital-straight line on 15 years life 10% salvage value.
Offsite Capital-straight line on 20 years life 10% salvage value.

(g) Income Tax: No income tax due for 1st ten years. Thereafter, tax rate is 35.75% of taxable net income less $13,166.

(h) All numbers in thousands.

DEFT EX 318 FOR ID.
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E 1243

E 1243

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LONG TERM DEBT AND CAPITAL STOCK

PUERTO RICO OIL AND PETROCHEMICAL COMPANY

LONG TERM DEBT:

6% Sinking Fund Debentures* due December 31, 1977	... $34,000,000
6% Sinking Fund Debentures* due December 31, 1982	... $34,000,000

*With Warrents Attached

COMMON STOCK:

Public Offering @ $1.00*	... $11,000,000
	$79,000,000

*Authorized and Issued: 15,000,000 shares of which 11,000,000 constitutes the Public Offering, first in Puerto Rico, for 60 days, and then open to outside areas. The balance of 4,000,000 shares to management.

In setting forth this plan for financing, the continuation of current market conditions is assumed. In addition, a contingency fund of 20% has been provided for the unforseen.

DEFT EX 327 FOR ID:
R. JACOBS 2/7 19 73

The Commonwealth will provide the plant site and all area facilities which will be used jointly with others. The company will provide those facilities which it will use exclusively, including the off-shore tanker berths. The Commonwealth will lease the plant site to the company.

# # #

E 1246

PHILLIPS PETROLEUM COMPANY

BARTLESVILLE, OKLAHOMA

November 13, 1962

STANLEY LEARNED
PRESIDENT

PLT EXT | 88 to PLT
D. HORN

SEP 21 1972

Prudential Oil Corporation
21 West Putnam
Greenwich, Connecticut

Attn: Mr. N. M. Shippee, Chairman

Gentlemen:

In connection with the Puerto Rico Oil and Petrochemical Company's petrochemical complex to be built in Puerto Rico, Phillips Petroleum Company is prepared to:

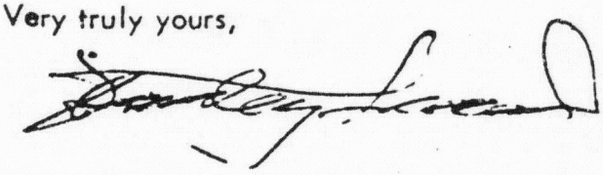
1 - Furnish 30,000 to 60,000 barrels per day of crude oil for charge stock;

2 - Purchase the refined petroleum products not consumed in the petrochemical operations;

3 - Counsel with you and assist, if you wish, in the design and construction and operation of the proposed facilities.

Whenever you desire, we shall be glad to have our representative work with you to negotiate and complete contracts.

Very truly yours,



MONSANTO CHEMICAL COMPANY
HYDROCARBONS DIVISION

E 1247

800 NORTH LINDBERGH BOULEVARD
ST. LOUIS 66, MISSOURI

November 19, 1962

Mr. E. J. Willey
Prudential Oil Corporation
21 West Putnam Avenue
Greenwich, Connecticut

Dear Mr. Willey:

Your letter of November 12 has been received.

We do have a potential requirement for a waxy feedstock for petrochemical manufacture. However, this material will be utilized in our pending project only if:

(1) Quality satisfactory
(2) Price within specified limits
(3) Availability clearly determined within next few months.

If these conditions cannot be met, our project will move in a completely different manner, involving different raw materials.

The desired waxy feedstock should:

(a) Be a 600-900°F. vacuum distillate
(b) Contain 30% wax
(c) Be as low in sulfur as possible
(d) Pass a final evaluation in our process.

If successful in "putting together" an operation based on such a feed, 15,000-20,000 bbl./day of the distillate would be required.

E 1248

We would certainly be interested in evaluating a sample of any proposed raw material. If whole crude is furnished, a five-gallon quantity would be needed; if 600-900°F. cut can be supplied (this is more desirable), one-gallon would be sufficient. In either event, sample should be shipped to:

Dr. B. L. Williams
Monsanto Chemical Company
Texas City, Texas

We should receive several weeks' advance notice on any shipments.

Your interest in working with us is appreciated; of particular interest is your statement that our pricing requirement can be met. We will look forward to hearing from you further.

Sincerely,

Norman J. Lewis

Norman J. Lewis

NJL/vc

DX-420-A-.. 7/6/73

E 1249

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

INTRODUCTION

The primary purpose of this study is to act as an aid in the investigation of the general economics and technology of a proposed 60,000 barrels per day (BPD) refinery processing a typical Venezuelan crude to produce normal petroleum fuels as well as the maximum feasible quantity of petrochemical raw materials and intermediates.

Included in this report are tables showing the operating cost and expenses, profitabilities and yield estimates of the various process units utilized in the original scheme and addendum thereto. Also, a general description of the processes with their flow diagrams are present.

The attached process and economic study is largely based on information developed and processed by Universal in regards to Puerto Rico. However, while the study has been prepared by us in accordance with established engineering practice and is useful in evaluating the proposed refinery and operations, it does not constitute any warranty, representation or guarantee with respect thereto. It is understood that Universal Oil Products Company's name shall not be used in connection with any prospectus or securities registration statement to be filed by your company with any governmental agency.

DX-420-C-ne 7/6/73

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Product Price	$/Bbl.	¢/Gal.
Premium Gasoline	4.979	11.86
Regular Gasoline	4.628	11.02
No. 1 Fuel Oil	3.896	9.28
No. 2 Fuel Oil	3.430	8.17
No. 6 Fuel Oil	2.151	5.12
Pitch	1.800	4.29
L.P.G. (C_3)	2.964	7.06
Mixed C_3's	2.964	7.06
Mixed C_4's	2.964	7.06
Benzene	10.500	25.00
Toluene	7.560	18.00
C_8 Aromatics	6.300	15.00
Raffinate	4.041	9.62
Naphthalene, ¢/#	—	(5.0)

Operating Costs

In constructing the operating costs for a Puerto Rican refinery various costs such as labor, utilities, fringe benefits, operating personnel requirements as effected by local labor efficiency, and other associated costs were taken into general consideration based on knowledge from current similar operations present in Puerto Rico.

Estimated Process and Offsites Investment

The estimated capital investment for process and offsites facilities of the proposed schemes are based on curve estimates of current day costs of similar equipment erected at a U.S. Gulf Coast location. These cost estimates are subject to precise design definition; however, they are sufficiently accurate for planning purposes. There may be some question arise as to the differences that construction costs would be lower in Puerto Rico than the United States Gulf Coast. It is believed that all major items of equipment will be shipped in from the U.S. which will increase material costs somewhat over Gulf Coast prices. Labor prices are lower in Puerto Rico but considering the available pool of skilled labor in Puerto Rico to construct a 60,000 BSD refinery is quite small. A construction firm would need to import continentals to supply the skill job classifications. This labor cost as well as somewhat higher material costs should just about equalize capital investment in Puerto Rico to that at the U.S. Gulf Coast location.

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Yield Estimates

The exactness of the yield estimates shown throughout are adequate for the purposes of this report, but will require confirmation for precise process designs. Depending on the final settlement of the type of crude to process and type of products to be produced will determine the process scheme as well as more precise yield.

In order to provide the highest reasonable degree of accuracy in the estimates made through this report, the respective product distribution and erected cost are based upon processes licensed by Universal Oil Products Company. Specific processes of the same general type will experience somewhat different product distribution and erected cost. Because of our greater familiarity with the specific capability and cost factors of these processes as compared with competing processes, the estimates shown in this report are based on processes as follows:

Specific UOP Process Used as Basis for Evaluation
Fluid Catalytic Cracking Process Unit (F.C.C.)
UOP Catalytic Condensation Process Unit
UOP 'HF' Alkylation Process Unit
UOP Platforming Process Unit
Unifining Process Unit
Udex Process Unit
Hydeal Process Unit
UOP Merox Process Unit

Other non-licensed processes and offsite facilities are the type that Universal has had many years of commercial experience in the design and economic evaluation.

Site Investigation Trip to San Juan

On February 20, 1962, a preliminary site survey was conducted in Puerto Rico.

The following are comments and general findings on the various locations viewed from the aerial and motor trip:

The north and east coasts of the island were ruled out due to lack of suitable unoccupied port sites. San Juan is already the site of one petroleum refinery and Roosevelt Roads is a U.S. Naval & Missile Base. Furthermore, the prevailing winds are northeasterly.

Five port sites were selected for consideration on the east, south and west coasts of the island, namely, Puerto Yabucoa, Bahia de Jobos (Central Aguirre), Bahia de Guayanilla, Bahia de Guanica and Bahia de Anasco. Each of these prospective sites will be discussed in detail.

Puerto Yabucoa

Playa de Guayanes is a small town serving as a port for Yabucoa located five miles inland. Yabucoa has a population of 5,300 with general stores, two small hotels, a hospital and telephone and telegraph facilities. San Juan is located 50 miles northwest by highway. The sugar industry furnishes business for the town and port. Only vessels of 14-foot draft or less can enter the harbor and the passage is difficult. Vessels navigate in and out of the harbor during daylight hours only. Strong northeasterly afternoon breezes make two anchors on a vessel necessary. Deep water is 1700 yards off shore and unprotected from the weather. The bay is two miles wide with numerous reefs and sunken rocks. An extended area of level, firm ground runs back from the bay to Yabucoa.

Bahia de Jobos

The harbor of Bahia de Jobos consists of an anchorage 5 miles long and varying in width from 1/2 mile to 1 mile. However, only 50% of this area is of a depth of 23 feet or greater. The bottom is soft and ships' anchors would drag during a hurricane. The land surrounding this harbor is low-lying and swampy. However, farther inland there are extended areas of level, firm ground.

The town of Central Aguirre located on Bahia de Jobos has a population of 3,000 with telephone and telegraph services. The sugar industry has a pier here 1,300 feet long. Vessels drawing up to 23 feet can berth on either side of it.

E 1253

Bahia de Guayanilla

Bahia de Guayanilla, located 7-1/2 miles west of Ponce, is the largest hurricane harbor, and one of the best in Puerto Rico. It can accommodate vessels of 40 feet draft or less. Commonwealth Oil Refining Company and Texas Company have wharves in this bay.

The town of Guayanilla with a population of 2,000 to 3,000 is located two miles inland and has no urban facilities. The limited amount of level ground between the bay and the town is rather low-lying for refinery construction. Punta Verraco, a point of land 1/2 mile wide and 1-1/2 miles long extending eastward outside the bay has no level land areas suitable for a refinery site without considerably land-leveling or benching and in time the area might prove to be rather cramped. Furthermore, a state forest is located just west of the bay and as a recreational resort might cause public relations problems for a petroleum refinery at some future date. The city of Ponce is located 12 miles to the east.

Bahia de Guanica

Bahia de Guanica is a good, natural harbor but too small and shallow for the berthing of oil tankers. Two small towns are located on the bay, Ensenada and Guanica. Each has a population of about 4,000 to 5,000. Telephone and telegraph services are available at both towns.

Bahia de Anasco

Bahia de Anasco is on the west coast of the island facing Mona Passage. Deep water runs in close to shore. In one area the water is 48 feet deep within 300 yards of the shore line. (This 48 feet depth area should be checked by sounding to confirm the hydrographic map.) On shore, extended areas of firm, level ground are available for choosing a refinery site, also electrical transmission lines run through this area. Judging from the lay of land sufficient fresh water should be available from water wells. However, in case additional water should be necessary, water reservoirs could be constructed without great difficulty in the hilly country just north of Bahia de Anasco.

The town of Anasco with a population of 3,500 is located 4 miles to the east of the bay and the city of Mayaguez with a population of 50,000 to 60,000 is located 12 miles to the south of the bay. Mayaguez has a shipping terminal that can accommodate vessels of 30 feet draft. This shipping terminal has a wharf 1200 feet long equipped with a shed 800 feet long by 60 feet wide plus various pieces of modern equipment for the mechanical handling of cargo.

Mayaguez has a number of stores and shops, two good hotels, telephone and telegraph service, an airport serviced by scheduled airline flights, plus a branch of the University of Puerto Rico. San Juan is 118 miles away by coastal highway. On Punta Higuero, 10 miles north of the bay, is a nuclear reactor in the construction stage.

After deliberating over the advantages and disadvantages of the five above-mentioned possible sites for a petroleum refinery, we believe that the Anasco Bay area should be chosen for the following reasons:

(1) A large area of firm, level land from which to choose a refinery site without pre-empting established settled areas.

(2) A bay which can be without difficulty fitted out with oil tanker berthing facilities.

(3) Likelihood of a good supply of fresh water.

(4) A petroleum refinery located here would be close to two centers of population - the town of Anasco and the city of Mayaguez. With these two centers of population nearby a ready-made labor market is at hand - already housed.

(5) The fact that there is a branch of the University of Puerto Rico in Mayaguez might be of interest to permanent refinery employees.

(6) Mayaguez has a suitable port for unloading construction material and refinery equipment with only a short haul to the refinery site.

(7) A petroleum refinery located on Bahia de Anasco would be in a favorable position to fuel ships sailing the Mona Passage.

(8) The area around Mayaguez and Bahia de Anasco has been by-passed by the rising tide of Puerto Rico economic development which is so evident at San Juan and Ponce.

(9) This area is serviced by a regularly scheduled airline as well as chartered flights.

(10) The area has a modern highway traversing it, backed up by a substantial secondary road system.

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(9) This area is serviced by a regularly scheduled airline as well as chartered flights.

(10) The area has a modern highway traversing it, backed up by a substantial secondary road system.

(11) Electrical power transmission lines run through this area with the power generating stations not too far away.

The only disadvantages that a petroleum refinery located near Bahia de Anasco would have is the fact that oil tankers serving the refinery would not have the protection of a suitable harbor like Bahia de Guayanilla.

A petroleum refinery located on Bahia de Guayanilla would have many of the same advantages listed for Bahia de Anasco, namely:

(1) It would be located close to a large center of population - the city of Ponce with a population of 100,000 to 110,000.

(2) Ponce has good port facilities.

(3) The area is served by a regularly scheduled airline as well as chartered flights.

(4) The area has a modern highway system.

(5) Electrical power generating stations are in the area.

(6) The Bahia de Guayanilla is an excellent harbor.

The disadvantages of locating a petroleum refinery in the Bahia de Guayanilla would be two:

(1) The smaller area of firm, level ground from which to choose a refinery site.

(2) The question of a good supply of fresh water must be investigated.

After reviewing the advantages and disadvantages of these two areas - Bahia de Anasco and Bahia de Guayanilla - it is apparent that the choice of a site hinges on whether oil tanker berthing facilities at Bahia de Anasco would cost a great deal more than similar facilities at Bahia de Guayanilla and, also, whether the Commonwealth of Puerto Rico wishes a further concentration of industry around Ponce or give the economy in the area around Bahia de Anasco and the city of Mayaguez a lift.

On Stream Time

345 stream days per year have been used giving a 95% on stream efficiency. For example, 60,000 barrels per stream day (BSD) of crude charge to the crude unit is 57,000 barrels per calendar day (BCD). The other 20 days left in the year are for process maintenance.

Utilities

Electricity - Assume purchase of power from Puerto Rico Water Resources Authority.

Refinery Fuel - Refinery fuel gases produced from the various processing units with the supplement requirements made up by using visbreaker pitch. Gaseous fuel deficiency would be made up by the pitch, which would be used preferably in the atmospheric and vacuum distillation and visbreaking unit.

Water Supply - A potable water supply for refinery sanitary facilities and steam boiler make-up is assumed to be obtained from fresh water wells. Process cooling water will be sea water.

Steam Generating Facilities - Sufficient refinery steam generating facilities have been provided even in the cases where a process having waste heat-steam generation facilities may be upset.

Inventories - Crude and Products

Since crude and product inventories tie up a large dollar value in a refinery of 60,000 BSD capacity, a strict control and review should set policy on this matter. It is assumed that crude inventory is twenty days for this size refinery. A leasing of super tankers to handle crude delivery should be investigated. A round trip for crude delivery by super tanker is considered about 5-8 days between Venezuela and Puerto Rico.

The majority of the products produced are considered for exporting to the east coast of the United States. A reasonable inventory was taken into account for the products considering time necessary for a round trip and quantity of material available for shipment by T-2 tankers.

A thorough investigation of the pitch and LPG local markets will aid in determining the economics of supplementary refinery fuel gas with either pitch or LPG. Large LPG inventories can be costly from the storage standpoint.

Acquirement of Total Capital Investment

The total capital investment was assumed to be raised by the following means as stipulated by Omega Management Incorporated.

20% of capital investment will be equity capital

80% of capital investment will be convertible sinking funds debentures, 6% interest rate, 20-year term.

In determining the economics of the two cases, it was assumed that the yearly sinking fund payment is 1/20 of the total debentures. Yearly payment is made at the end of the year and from income after taxes. The 6% interest rate on the sinking fund debentures is one the year beginning unpaid balance of debentures.

Equity capital is in the form of common stock.

Income and Property Tax

During the first ten years of the proposed cases no corporate income or property tax is due. The rates used after that are based on the current rates as developed by the Department of the Treasury, Commonwealth of Puerto Rico and listed in "What You Should Know About Taxes in Puerto Rico," 1961 edition.

Depreciation Rates and Items

Depreciation rates and items used in the economics of the two cases are considered normal for a typical refinery. However, there are always extremes from the average for various reasons and is determined by company policy, within government regulations.

Process and offsites facilities and starting capital are considered the depreciable items. Depreciation rate is as follows:

1. Process capital - straight line on 15 years life - 10% salvage value
2. Offsites capital - straight line on 20 years life - 10% salvage value
3. Startup capital - straight line on 10 years life.

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E 1259

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

BASIC CONSIDERATIONS

In performing the study certain assumptions were made and are listed in this section under various categories.

Crude Oil Supply and Price

In reviewing the crude oils that are available from Venezuela, several crudes were found to be typical and in sufficient production quantity that could supply the needs of the proposed refinery. For this study, a Venezuelan crude known as Tia Juana Medium crude was used. This crude is believed to be available for long term contracts. A laid-in price at the refinery for this crude was taken at $2.35/bbl.

Product Market and Prices

The quantity of petroleum products produced from a 60,000 BSD refinery located in Puerto Rico were assumed to be, to a great extent, exported out of the country to the east coast markets of the United States. Current output of the two refineries presently in Puerto Rico far outdistances current and future demands of petroleum fuel for local market consumption. A relatively high percentage of the current refinery outputs are exported to the east coast markets. The assumption was also made with petrochemical raw materials and intermediates although joint ventures or future petrochemical expansion would limit the export of petrochemicals so derived.

Therefore, all petroleum fuel products and petrochemical material were assumed to have sufficient export and local markets to absorb all production quantities. It is suggested than an organization contemplating entering in the refining or petrochemical industry should make a close examination to determine their market position as to the type of products and quantities they wish to handle under long term manufacturing contracts.

Product prices used in the study are believed to be those generally applicable to those received at the refinery gates in the Puerto Rico area. They are a combination of local market prices and export market prices.

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PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

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PROCESS DESCRIPTION AND YIELDS

INTRODUCTION

Block flow diagram No. 76845-C-O shows the general processing scheme that is utilized in this case. The main considerations were to design a refinery with a maximum of flexibility to produce normal petroleum fuels and a maximum of petrochemicals and petrochemical feedstocks. The flexibility of design is required to provide additional petrochemicals and petrochemical feedstocks in the future.

The process flow is described below:

CRUDE DESALTING

While the crude used for this study does not show an appreciable amount of salt, electrical desalting equipment is provided to enable crudes to be processed, which are less satisfactory in this regard.

ATMOSPHERIC DISTILLATION

In this scheme one 60,000 BSD unit is considered rather than the possibility of two smaller units of 30,000 BSD capacity each.

Preflashing or prefractionation is chosen to give the most economical use of heat. A light straight run stabilizer is provided. The Tia Juana Medium light straight run in particular needs to be stabilized and while the stabilizer could be omitted with the light straight run stabilized in the FCC Gas Recovery unit, this would reduce operating flexibility. Only one grade of gasoline then could be produced.

A light naphtha, 165-270°F., is taken overhead from the atmospheric crude column and is processed in a Unifiner for sulfur removal and is further processed as described later. A heavy naphtha, 270-450°F., is taken as a side stream from the crude column and is processed in a Unifiner for sulfur removal and to further processing as described later. A middle distillate (450-650°) is taken as a side stream from the crude tower, processed in a Unifiner for sulfur reduction and sent to storage as a finished product. The reduced crude from the bottom of the crude tower is sent to vacuum unit.

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VACUUM DISTILLATION

The function of this unit is to prepare vacuum gas oil as charge to the FCC unit. It should be designed carefully to keep entrainment of asphalt from the gas oil to a minimum and thus at the same time keep the metal contaminants, harmful to the FCC operation, at a minimum in the FCC feed. The vacuum pitch obtained from the bottom of the vacuum unit is sent to the visbreaking unit.

VISBREAKING UNIT

Visbreaking is particularly advantageous in a dual process function. It prepares distillate stocks and at the same time reduces the viscosity of residual bottoms so that less cutback material is required to meet No. 6 fuel oil specification. Light materials from this operation are sent to FCC Gas Recovery system for recovery of the C_3's and C_4's. The visbreaker gasoline is split into two fractions, a C_5-270°F. and a 270-400°F. material. Each fraction is joined with the respective virgin naphtha fraction, processed in a Unifiner for sulfur reduction and olefin saturation, and then to further processing as described later. The vacuum pitch is sold with cycle stock (FCC cycle oils) as No. 6 fuel oil or burned as a fuel within the refinery or by other industrial consumers close to the refinery.

FLUID CATALYTIC CRACKING AND GAS RECOVERY UNITS

This system of Catalytic Cracking has been chosen as it has been most widely accepted in the industry and is the most representative. The function of this unit is to convert heavy distillate oils into high octane gasoline and to reduce the overall refinery fuel oil production. Current designs are noted for simplicity, ease of operation and low operating and investment costs. The process also gives good yields of mixed C_3 and C_4 saturate and olefin compounds which can be used for alkylation, catalytic condensation or for petrochemical intermediates.

Charge stock for the FCC has been prepared by the vacuum unit. A conversion level of 70% has been used in this scheme for maximizing light olefin production. However, as mentioned in the introduction, if the pitch sales are not large, conversion level could be reduced for sufficient cycle oils to be produced for blending into No. 6 fuel oil.

FLUID CATALYTIC CRACKING
AND GAS RECOVERY UNITS (Cont'd) E 1262

The gas recovery section (gas concentration) may receive, in addition to the light products from the FCC unit, light products from other refinery sources as straight run stabilizer overhead, Platforming debutanizer overhead and the visbreaking light material. The gas recovery section produces fuel gas, mixed C_3's and C_4's and a debutanized gasoline which is routed to the gasoline pool as a blending component.

LIGHT AND HEAVY NAPHTHA UNIFINING UNITS

An uncomplicated, easily operated process for eliminating sulfur, nitrogen and metallic impurities from petroleum distillates, Unifining provides a simple and economical answer to an operating problem that is frequently difficult and costly to solve by other methods. Also Unifining will simultaneously saturate any olefin present in the feedstocks. It clearly removes impurities and prepares feedstocks of ideal properties for further processing.

Unifining works particularly well in combination with Platforming. It is ideal for pretreating Platformer feedstocks and the excess hydrogen from the Platformer is an excellent, low cost hydrogen source for the unit.

The feed to each of the naphtha Unifiners is comprised of the respective boiling range virgin naphthas from the crude unit and the visbreaker gasolines. Sulfur reduction and olefin saturation occurs during this operation. Hydrogen required for these steps is received from the Platforming unit. H_2S and light materials produced during Unifining are stripped in the Unifiner stripper. The stripper bottoms then become charge to the Platforming unit.

B-T-X PLATFORMING AND HEAVY NAPHTHA PLATFORMING UNITS

This is one of the most widely used processes in the refining industry. In operation on a broad scale it has proved to be practical and an economical process for upgrading low octane gasolines.

Platformer feedstock is received from the Unifiner stripper. Processing conditions are selected so that a 90 F-1 clear C_5+ Platformate is obtained from the Platformer debutanizer and is routed to the gasoline pool as a high octane

B-T-X PLATFORMING AND
HEAVY NAPHTHA PLATFORMING UNITS (Cont'd) E 1263

blending component. The debutanizer overhead material is sent to the FCC recovery unit for recovery of propane, iso and normal butanes present in the streams. The net separator gas becomes a source of low cost hydrogen for the Unifining operation.

Under proper operating conditions, Platforming fits well into the growing demand for petrochemicals as it is highly efficient for producing a material that contains aromatics such as benzene, toluene and xylenes and these can be readily extracted from the Platformate. As in this scheme, a Unifined naphtha in the boiling range of 165-270°F. is the feedstock for B-T-X Platforming operations. A dependanized Platformate is obtained and this becomes feedstock to a Udex unit as described later. A C_5's and C_4's fraction is recovered and sent to the gasoline pool as a blending component. The depropanizer overhead material is sent to the FCC gas recovery unit for recovery of propane. The net separator gas becomes a source of low cost hydrogen for the Unifining operation.

Within a recent period, under proper operating conditions, it has been found that the Platforming process may produce a material from which naphthalene could be derived. As in this scheme, a Unifined naphtha in the boiling range of 270-450°F. is the feedstock for heavy naphtha Platforming operations. A total depropanized Platformate is obtained which is rerun into a C_4-390°F. and a 390-E.P.°F. fraction. The C_4-390°F. fraction is routed to the gasoline pool as a blending component. The 390°-E.P. fraction becomes a feedstock for further processing as described later for naphthalene production. The depropanizer overhead material is sent to the FCC gas recovery unit for recovery of propane. The net separator gas becomes a source of low cost hydrogen for the naphthalene operation.

DISTILLATE UNIFINING

This proposed method of distillate treating, where hydrogen is available, is based on Universal's considerable experience in the Unifining of distillate oils. Sulfur reduction to meet specifications is the prime function of this operation and the required reduction is readily obtained.

DISTILLATE UNIFINING (Cont'd)

The middle virgin distillate (450-650°F.) as obtained from the crude column combines with a necessary portion of the B-T-X Platformer net separator gas and after heating passes into the Unifiner reactor system. Sulfur reduction in the distillate fraction is the prime purpose of this operation. The product after the Unifiner reactor is stripped and rerun to meet flash point specification to give a product as No. 2 fuel oil.

UDEX EXTRACTION AND B-T-X RECOVERY UNIT

The Udex process is designed to prepare high purity aromatics from catalytic reformate. The Udex process has been proved commercially to be an outstanding method for the preparation of aromatics of purities not previously attained. The aromatic products of the Udex process will not only meet the established ASTM nitration grade specifications but will exceed them. Nitration grade benzene has a minimum solidification point of 4.85°C. The benzene produced commercially from catalytic reformate processed in Udex units has consistently been well above the 5.40°C solidification point. The toluene fraction will have comparable freedom from paraffin impurities. High aromatic product purities are attained which maintains high recovery efficiencies. The benzene recovery efficiency attained in commercial Udex operation has been well above 99%.

The feedstock for the Udex unit in this proposed scheme is the depentanized Platformate obtained from the B-T-X Platforming operation. Through the extraction step, the extract product so obtained has a high purity aromatic content.

However, the extract contains traces of unsaturates, which would limit the purity of the final products and may also contain traces of residual non-hydrocarbon compounds which would spoil the acid-wash color test of the final products. To destroy these trace impurities the extract is processed through Attapulgas or similar clay before final distillation.

Redistillation of the product is accomplished in three columns in succession making pure benzene and toluene respectively as overhead products, a C_8 aromatic fraction as overhead product and a C_9 plus aromatics product off the bottom of the xylene column.

The isomer distribution in the C_8 aromatic fraction derived from petroleum stocks is approximately:

	Vol.%
ethylbenzene	20
p-xylene	18
m-xylene	42
o-xylene	20

The raffinate obtained from the extraction step is highly paraffinic and needs very little treatment before it is sent to storage. It can be used as a low octane blending component, a jet fuel blending component, or a charge stock for an ethylene cracking process.

HYDEAL

The Hydeal Process is a new process recently announced by Universal. This process is designed for the conversion of alkylbenzenes to benzene or alkylnaphthalenes to naphthalene.

The Hydeal unit proposed for this scheme is designed to convert alkylnaphthalenes to naphthalene. Feedstock is derived from the Heavy Naphtha Platforming operation. The 390-E.P.°F. Platformate fraction usually contains sufficient quantities of alkylnaphthalenes for economical conversion of these compounds into naphthalene. Also present in these feedstocks are some alkylbenzenes that are converted to benzene. The hydrogen source for this reaction is the net separator gas from the Heavy Naphtha Platforming operation.

MEROX

The UOP Merox Process is a fairly new process announced by Universal and is additional evidence of UOP's policy of providing the refining industry with every means for a well-rounded, profitable manufacturing operation. This process provides a low cost operation for treating gasoline and lower boiling fractions for removal of mercaptans, or sweetening heavier stocks by converting mercaptans to disulfides.

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PROCESSING AND ECONOMIC DATA

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ADDENDUM

ISOMAX CASE

An alternative scheme with respect to the base case considered in our study of April 13, 1962 is presented herewith.

The alternate case included the following changes with respect to the base case:

1. The Fluid Catalytic Cracking Process unit has been replaced by an Isomax Process unit.

2. A hydrogen manufacturing plant has been added to satisfy hydrogen requirements for the Isomax Process unit.

3. The aromatics producing facilities have been increased in size. Additional charge will be gasoline from the Isomax Process unit.

The same general statements and assumptions as presented in the base case apply to this alternate case.

Block flow diagram No. 76845-C shows the general processing scheme of the Isomax Case. The main considerations were to produce normal petroleum fuels that will meet general product specifications as well as producing petrochemicals.

Attached tables I through XXII show economic and technical information on this alternate case.

The scheme presented indicates a fairly good return of common equity. It is estimated that a 60,000 B/D refinery following this scheme can be built in Puerto Rico at a cost of about $68 million, including working capital and start-up expenses. This cost exceeds the base case cost by $11 million. However, the payouts in both cases are similar and the net earnings on equity in the Isomax Case are over $9 million above the base case in a 20-year period.

The alternate case offers the following additional advantages:

1) The Isomax Process is characterized by an inherent ability to process a widely diversified range of charging stocks. Included in the list are not only the virgin stocks varying in boiling range from kerosenes to heavy vacuum gas oils, but thermal and catalytic cycle stocks as well.

2) In addition to versatility as regards charging stock Isomax is a very flexible process. Never before have refiners had such control over maximizing gasoline production or conversely middle distillate production. This is particularly important in order to meet changing market demands.

3) Due to the flexibility of Isomax, product inventories can be reduced.

4) The naphtha produced in an Isomax unit is an excellent feedstock for Platforming to produce high grade gasoline and/or aromatics.

5) High quality middle distillates are produced with Isomax.

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PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE II

ESTIMATED DIRECT OPERATING COST

	$/SD
1. Refinery Labor	
Including Maintenance, Safety, Warehouse and Utilities	6,868
2. Tetraethyl Lead	
Cost @ 0.25¢/cc T.E.L.	1,645
3. Maintenance - Offsites and Process	5,985
4. Laboratory and Miscl. Supplies	200
5. Catalyst	
(a) Isomax catalyst @ 30 bbls/lb per stage @ $1.60/Lb	1,517
(b) Platforming catalyst	
1. B-T-X Platformer - 50 bbl/lb	623
2. Hvy.Naph.Platformer - 55 bbl/lb @ $3.45/lb net replacement	839
(c) Unifining catalyst	
1. Naphtha Unifiner @ 200 bbl/lb @ $1.60/lb	116
2. Distillate Unifiner @ 200 bbl/lb @ $1.05/lb	62
(d) Hydeal catalyst @ 5 bbl/lb @ $1.00/lb	248
Total Catalyst	3,405
6. Chemicals and Inhibitor	
(a) Gasoline additives	
1. Sweetening agent 3 lbs/1000 bbls @ $1.00/lb	39
2. Corrosion inhibitor, 6 lbs/1000 bbls @ 39¢/lb	30
3. Metal inhibitor 1 lb/1000 bbls @ $1.00/lb	13

(contd.)

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TABLE II (contd.)

ESTIMATED DIRECT OPERATING COST

	$/SD
6. Chemicals and Inhibitor (contd.)	
(b) Corrosion inhibitor, ammonia, lime, amine, etc. @ 30¢/lb	42
(c) Water treating, $1.50 per day/1000 GPM Circ.	121
(d) Glycol @ 0.1 lb glycol/bbl of charge @ 17¢/lb	125
(e) Clay @ 0.5 lb clay/bbl of aromatics @ $30/ton	23
Total Chemicals	393
7. Royalties (Running Basis)	
(a) Isomax 5.5¢/bbl charge	782
(b) Platforming @ 5.5¢/bbl charge	1,234
(c) Unifining	
Naphtha Unifining - waiver	-
Distillate Unifining @ 1.5¢/bbl charge	178
(d) Hydeal @ 5% of naphthalen sale value and 0.5¢/gal benzene	797
(e) UDEX @ $250,000 amortized over 10 years	73
Total Royalties	3,064
8. Insurance	
Estimated @ 2.0% of process, offsites and inventories	3,678
9. Utilities	
Electricity @ 1.0¢/K"H	3,969
Fuel*	6,232
Cooling water @ 0.9¢/1000 gals once-through	770
Steam @ 55.0¢/1000 lb	2,033
Total Utilities	13,004
Total Direct Operating Cost	38,242

*Pitch used to supplement refinery gas.

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FOR A PROPOSED PUERTO RICO REFINERY

TABLE III

ESTIMATED UTILITIES

Electricity	KW
Crude, Vacuum and Stabilizer Units	575
Light Naphtha Unifining Unit	290
Heavy Naphtha Unifining Unit	405
Distillate Unifining Unit	800
B-T-X Platforming Unit	1,632
Heavy Naphtha Platforming Unit	1,985
UDEX Unit	390
Naphthalene Hydeal Unit	1,310
Isomax and Gas Concentration Units	5,660
Visbreaking Unit	550
Hydrogen Plant	450
Subtotal	14,047
Offsites and Miscellaneous	2,490
Total	16,537

Fuel	10^6 BTU/Hr
Crude, Vacuum and Stabilizer Units	-327
Light Naphtha Unifining Unit	- 31
Heavy Naphtha Unifining Unit	- 46
Distillate Unifining Unit	- 38
B-T-X Platforming Unit	-142
Heavy Naphtha Platforming Unit	-185
UDEX Unit	- 3
Naphthalene Hydeal Unit	- 94
Isomax and Gas Concentration Units	-170
Visbreaking Unit	-104
Hydrogen Plant	-450
Subtotal	-1,590
Boiler House	-166
Total	-1,756

BTU/Day required	$42,140 \times 10^6$ BTU
BTU/Day from fuel gas	$18,720 \times 10^6$ BTU
BTU/Day needed to be purchased	$23,420 \times 10^6$ BTU

Therefore 3,720 B/D pitch used to supplement refinery fuel gas.

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TABLE III (contd.)

ESTIMATED UTILITIES

Page 2

Cooling Water	GPM
Crude, Vacuum and Stabilizer	10,850
Light Naphtha Unifining Unit	980
Heavy Naphtha Unifining Unit	1,450
Distillate Unifining Unit	1,790
B-T-X Platforming Unit	4,050
Heavy Naphtha Platforming Unit	6,090
UDEX Unit	6,600
Naphthalene Hydeal Unit	6,000
Isomax and Gas Concentration Units	4,700
Visbreaking Unit	4,300
Hydrogen Plant	12,500
Miscellaneous	100
Total	59,410

Steam	1,000 Lbs/Hr
Crude, Vacuum and Stabilizer	-39.0
Light Naphtha Unifining Unit	-
Heavy Naphtha Unifining Unit	-
Distillate Unifining Unit	-
B-T-X Platforming Unit	-
Heavy Naphtha Platforming Unit	-
UDEX Unit	-99.0
Naphthalene Hydeal Unit	- 1.6
Isomax and Gas Concentration Units	-
Visbreaking Unit	-
Hydrogen Plant	-
Miscellaneous	-14.4
Total	-154.0
Visbreaker Steam Generator	+19.0
Boiler House	+135.0
Total	+154.0

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

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TABLE IV

ESTIMATED PERSONNEL REQUIREMENTS

	Per Day*
Management	
Manager	1
Assistant Manager)	1
Process Superintendent)	
Chief Engineer)	1
Mech. Superintendent)	
Personnel Manager	1
Chief Chemist	1
Comptroller	1
With above:	
Secretaries	6
Total Management	12
Office	
General Accounting Manager)	1
Refinery Accounting Manager)	
Oil Accounting Manager	1
Material Accounting Manager	1
Accounting Clerks	2
Yield Accountant	1
Billing Clerk	1
Tanker Agent	1
Payroll Clerk	3
Shipping Clerk)	3
Purchasing Agent)	
Office Service:	
Receptionist/Telephone Operator	1
Stenographers and Typists	8
Total Office	23
Laboratory	
Chemists	6
Knock Tester	1
Podbielniak Operator	1
Technicians	11
Washers	3
Samples	4
Total	26

*5 day work week - 8 hours per day.

TABLE IV (contd.)

ESTIMATED PERSONNEL REQUIREMENTS

Page 2

	Per Day*
Safety	
Chief Safety Engineer	1
Assistant Chief Safety Engineer	1
Fireman and Safety Personnel	6
Total	8
Technical and Economics - Case I - Case II	
Technical Superintendent)	1
Economics Superintendent)	
Engineers	6
Secretary	1
Total	8
Warehouse	
Chief Storekeeper	1
Assistant	2
Clerks	2
Helpers	6
Total	11
First Aid	
Doctor	1
Medical Assistant	1
Nurses	3
Total	5
General Workers and Security	
Chief Watchman	1
Shift Watchman	15
Porters	4
Yardmen	4
Total	24

(contd.)

TABLE IV (contd.)

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ESTIMATED PERSONNEL REQUIREMENTS

Page 3

Maintenance	Per Day*
Chief Mechanical Engineer	1
Chief Civil Engineer	1
Draftsmen	[illegible]
Mechanical Foreman	3
Pipefitters	9
Pipefitters Helpers	2
Welders	2
Welders Helpers	4
Machinists	[illegible]
Machinists Helpers	3
Pump Mechanics	4
Pump Mechanics Helpers	4
Boiler Makers	1
Boiler Makers Helpers	3
Chief Electrician	3
Electricians	6
Electrician Helpers	2
Instrument Men	2
Carpenters	2
Carpenters Helpers	2
Painters	4
Painters Helpers	1
Insulator	
Bricklayers	
Bricklayers Helpers	2
Mason	2
Mason Helpers	[illegible]
Truck Drivers	
Garage Mechanics, etc.	
Labor Foremen	[illegible]
Laborers	
Total	138

Oil Movement	
Superintendent	1
Assistant Superintendent	1
Cargo Inspector	1
Pumpers	9
Pumpers Helpers	9
Gaugers	9
Dock Clerks	3
Pumpers	3
Pipe Fitters	4
Pipe Fitters Helpers	10
Truck Loaders	4
Truck Loaders Helpers	4
Oil Separator Operators	4
Total	62

TABLE IV (contd.) E 1275

ESTIMATED PERSONNEL REQUIREMENTS

Page 4

Operations	Per Shift
Shift Foreman	1
Crude, Vacuum and Stabilizer	
Senior Operator	1
Board Man	1
Helper	2
Visbreaking Unit	
Senior Operator	1
Board Man	1
Helper	1
Naphtha Unifiner - BTX Platformer-UDEX	
Senior Operator	1
Board Man	2
Helper	3
Naphtha Unifiner - Platformer - Hydeal	
Senior Operator	1
Board Man	2
Helper	3
Distillate Unifiner	
Senior Operator	1
Helper	1
Isomax, Hydrogen Plant and Gas Concentration	
Senior Operator	1
Board Man	1
Helper	2
Boiler House	
Senior Operator	1
Water Treating and Pumping	2
Treaters and Splitter	
Board Man	1
Helper	1
Total	31

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FOR A PROPOSED PUERTO RICO REFINERY

TABLE V

ESTIMATED PERSONNEL REQUIREMENTS AND COSTS

	No.	$/SD
Management	12	642
Office	23	262
Laboratory	26	346
Safety	8	100
Technical and Economics	8	176
Warehouse	11	182
First Aid	5	63
General Workers and Security	24	300
Maintenance	138	1,800
Oil Movement	62	583
Operations	131	2,414
Total	448	6,868

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

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TABLE VI

ESTIMATED PROCESS INVESTMENT

Process Units	Material and Labor Costs
1. Crude Unit Including desalter, full corrosion protection and stabilizer	$ 2,000,000
2. Vacuum Unit	1,200,000
3. Light Naphtha Unifining Unit	550,000
4. Heavy Naphtha Unifining Unit	700,000
5. Distillate Unifining Unit	1,200,000
6. B-T-X Platforming Unit	1,800,000
7. Heavy Naphtha Platforming Unit	2,250,000
8. UDEX Unit	1,850,000
9. Naphthalene Hydeal Unit	3,100,000
10. Isomax and Gas Concentration Unit	6,600,000
11. Visbreaking Unit	2,100,000
12. Hydrogen Plant	2,750,000
13. C_3/C_4 Merox Unit	60,000
Process Units - Total M and L	$26,160,000
Design, engineering, contractor's expense and overhead	5,340,000
Total	$31,500,000
Allowance for ocean freight, local freight, unloading and hauling to site	$ ~~2,300,000~~

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

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TABLE VII

ESTIMATED OFFSITES FACILITIES INVESTMENT

	Material and Labor
Utilities	
Steam generating system	
Water treating facilities	
Fresh water supply	
Refinery fuel system	
Cooling water system	
Electric power system	
Compressed air system	$ 3,100,000
Service Facilities	
T.E.L. blending	
Fire fighting equipment	
Refinery flare and blowdown system	
Oil separation and retention pond	
Sewer system	
Telephone system	
Fencing and gates	
Roads and parking areas	
Truck load racks	1,400,000
Buildings and Contents	800,000
Tankage and Accessories	
Tankage	
Tankage accessories	
Transfer pumps	
Yard piping	10,000,000
	$15,300,000
Design, engineering, contractor's expense and overhead	3,000,000
	$18,300,000
Allowance for ocean freight, local freight unloading and hauling	2,300,000

Not included in above estimates are the following:

- Land
- Docks and wharfs
- Site preparation
- Piling if required

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE VIII

ESTIMATED INITIAL INVENTORY REQUIREMENTS

	Barrels	Dollars
1. Charge Stocks		
Crude, 20 day inventory	1,200,000	2,820,000
2. Products		
Gasoline		
Premium, 25 days inventory	97,850	487,200
Regular, 25 days inventory	228,330	1,056,700
Benzene, 30 days inventory	28,000	352,800
Toluene, 30 days inventory	31,700	239,700
C8 Aromatics, 30 days inventory	33,100	208,500
Raffinate, 25 days inventory	119,500	482,900
Naphthalene, 30 days inventory	20,500	411,500
Mixed C3's, 15 days inventory	25,900	76,800
Mixed C4's, 15 days inventory	25,100	74,400
No.2 Fuel Oil, 25 days inventory	125,000	428,700
No.6 Fuel Oil, 25 days inventory	329,300	708,300
Total	1,064,280	4,527,500
3. Catalyst Initial Loading and a Spare Loading	Pounds	
Isomax	540,600	865,000
Naphtha Unifiners	64,600	103,400
Distillate Unifiner	44,500	46,700
B-T-X Platformer	52,600	286,700
Hvy. Naphtha Platformer	108,500	857,200
Hydeal	125,600	125,600
Total	2,123,100	2,284,600
4. Spare Parts	- -	1,250,000
Total		8,062,100

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

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TABLE IX

ESTIMATED STARTUP AND WORKING CAPITAL

Section 1 - Startup Capital	
A. Labor - 60 days supervision	$ 267,200
30 days operating and training	72,400
B. Utilities - 30 days startup and training	407,250
Total Startup Capital to Depreciable Capitalization	$ 746,850
Section 2 - Working Capital	
A. Charge Stock - 20 days inventory	$ 2,820,000
B. Products - necessary inventory	4,527,500
C. Direct Operating Costs - 30 days	757,140
Total Working Capital to Non-Depreciable Capitalization	$ 8,104,640

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE X

ESTIMATED TOTAL INVESTMENT

Initial Catalyst and Chemical Loading and Spare Parts	$ 3,534,600
Process Investment	35,500,000
Offsites Investment	20,600,000
Startup and Working Capital	
(a) Depreciable	746,850
(b) Non-depreciable	8,104,140
Total	$ 68,485,590

PROCESSING AND ECONOMIC DATA E 1282

FOR A PROPOSED PUERTO RICO REFINERY

TABLE XI

ESTIMATED GROSS MANUFACTURING MARGIN

Products	B/D	$/Bbl	¢/Gal	$/D
Gasoline, Premium	3,914	4.979	11.86	19,488
Regular	9,133	4.628	11.02	42,268
Total	13,057			61,756
Benzene	932	12.60	30.00	11,743
Toluene	1,058	7.56	18.00	7,998
C8 Aromatics	1,104	6.30	15.00	6,955
Raffinate	4,779	4.041	9.62	19,276
Naphthalene (¢/Lb)	687	-	(5.0)	13,716
Mixed C3's	1,725	2.964	7.06	5,113
Mixed C4's	1,674	2.964	7.06	4,962
No. 2 Fuel Oil	17,458	3.430	8.17	59,881
No. 6 Fuel Oil	5,000	2.151	5.12	10,755
Pitch	13,172	1.800	4.29	23,710
Value of Production	60,646			225,865
Charge				
Crude	60,000	2.350	5.60	141,000
Cost of Raw Material				141,000
Gross Manufacturing Margin				84,865

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PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE XII

ESTIMATED REFINERY CONSOLIDATED YIELDS

Charge	B/D	Vol.%	Lbs/Hr	Wt. %
Tia Juana Medium Crude	60,000	100.0	780,046	100.00
Refinery Yield				
1. Gasoline				
Lt.St.Run	3,404	5.7	30,243	3.88
C_4-390° F Platformate	9,653	16.1	110,382	14.15
	13,057	21.8	140,625	18.03
2. Benzene	932	1.6	11,986	1.54
3. Toluene	1,058	1.8	13,250	1.70
4. C8 Aromatics	1,104	1.8	13,783	1.77
5. Raffinate	4,779	8.0	49,353	6.33
6. Naphthalene	687	1.1	11,430	1.47
7. Mixed C_3's	1,725	2.9	12,938	1.66
8. Mixed C_4's	1,674	2.8	14,386	1.84
9. No. 2 Fuel Oil	17,458	29.1	155,960	20.00
10. No. 6 Fuel Oil	5,000	8.3	79,145	10.15
11. Pitch*	13,172	22.0	212,631	27.23
12. Fuel Gas (F.O.E.)	2,975	5.0	64,558	8.28
	63,621	101.7	780,046	100.00

*Includes 3,720 B/D pitch used to supplement refinery fuel gas.

PROCESSING AND ECONOMIC DATA E 1284

FOR A PROPOSED PUERTO RICO REFINERY

TABLE XIII

ESTIMATED CRUDE UNIT YIELDS

Charge	°API	B/D	Vol.%	Lbs/Hr	Wt. %	Lb/Gal
Tia Juana Medium Crude	27.1	60,000	100.0	780,000	100.0	7.429
Yields						
IBP - 165° F	-	2,040	3.4	17,706	2.27	-
165-270° F	62.0	5,100	8.5	54,288	6.96	6.087
270-450° F	45.4	7,680	12.8	89,544	11.48	6.660
450-650° F	38.6	11,880	19.8	143,988	18.46	6.926
650-1000° F	19.9	14,220	23.7	193,674	24.83	7.783
Vac. Bottoms	8.6	19,080	31.8	280,800	36.00	8.412
		60,000	100.0	780,000	100.00	

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PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE XIV

ESTIMATED VISBREAKING YIELD

Charge	°API	B/D	Vol.%	Lbs/Hr	Wt. %	Lbs/Gal
Vacuum Bottoms	8.6	19,080	100.0	280,800	100.0	8.412
Yields						
H_2S				618	0.22	
H_2				28	0.01	
C_1				899	0.32	
$C_2=$				365	0.13	
C_2				1,207	0.43	
$C_3=$		153	0.8	1,191	0.41	
C_3		210	1.1	1,488	0.53	
C_4		210	1.1	1,769	0.63	
iC_4		57	0.3	534	0.19	
nC_4		76	0.4	702	0.25	
C_5-400° F	56.0	1,755	9.2	19,319	6.88	6.283
Fuel Oil, 300 Cs @ 210° F	8.6	17,172	90.0	252,720	90.00	8.412
		19,633	102.9	280,800	100.00	

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PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE XV

ESTIMATED ISOMAX YIELDS

Charge	°API	B/D	Vol.%	Lbs/Hr	Wt. %	Lbs/Gal
Vacuum Gas Oil	19.9	14,220	100.0	193,680	100.0	7.783
H_2 (Chemical)				6,585	3.4	
				200,265	103.4	

Yields					
H_2S				2,905	1.5
C_1				1,162	0.6
C_2				1,162	0.6
C_3				3,680	1.9
C_4		1,095	7.7	9,103	4.7
C_5/C_6		1,962	13.8	19,174	9.9
C_7/400° F		6,939	48.8	80,377	41.5
400-625° F	33	6,513	45.8	82,702	42.7
Total		16,509	116.1	200,265	103.4

Properties of Products	C_5/C_6	C_7-400° F
F-1 Octane, Clear	80	56
+3cc.	97	79

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PROCESSING AND ECONOMIC DATA
FOR A PROPOSED PUERTO RICO REFINERY

TABLE XVI

ESTIMATED B-T-X PLATFORMING YIELDS

Charge	°API	B/D	Vol.%	Lbs/Hr	Wt. %	Lbs/Bbl
Unifined Virgin 165-270° F	62.0	5,100	56.54	54,273	56.57	6.087
Unifined Wilbur, 165-270° F	63.4	810	8.98	8,568	8.93	6.044
Light Isomaxate	62.0	3,100	34.48	33,090	34.50	6.067
		9,020	100.00	95,931	100.00	

Yields				
H_2			1,477	1.54
C1			259	0.27
C2			1,180	1.23
C3	372	4.12	2,753	2.87
C_4's	537	5.95	4,451	4.64
C_5's	494	5.48	4,451	4.64
C6 Paraffins	1,254	13.90	11,953	12.46
C7 Paraffins	1,214	13.46	11,991	12.50
C8 Paraffins	941	10.43	9,555	9.96
C9 Paraffins	327	3.63	3,386	3.53
Methyl Cyclopentane	184	2.04	1,995	2.08
Cyclohexane	26	0.29	297	0.31
C7 Naphthenes	105	1.16	1,161	1.21
C8 Naphthenes	44	0.49	499	0.52
C9 Naphthenes	26	0.29	288	0.30
Benzene	390	4.32	4,950	5.16
Toluene	1,102	12.22	13,805	14.39
C8 Aromatics	1,227	13.60	15,312	15.96
C9+ Aromatics	487	5.40	6,168	6.43
	8,730	96.78	95,931	100.00

PROCESSING AND ECONOMIC DATA
FOR A PROPOSED PUERTO RICO REFINERY

TABLE XVII

ESTIMATED UDEX YIELDS

Charge

Depentanized Platformate - See Table Estimated B-T-X Platforming Yields

Yields

Extract

Platforming Yields, B/D		Recovery Factors	Recovered
Benzene	390	99%	386
Toluene	1,102	96%	1,058
C8 Aromatics	1,227	90%	1,104

Raffinate

C_6 Paraffins	1,254
C_7 Paraffins	1,214
C_8 Paraffins	941
C_{9+} Paraffins	327
Methyl Cyclopentane	184
Cyclohexane	26
C_7 Naphthenes	105
C_8 Naphthenes	44
C_9 Naphthenes	26
Benzene	4
Toluene	44
C_8 Aromatics	123
C_{9+} Aromatics	487

General Properties of Raffinate

F-1 Clear	62.0
F-1 +3cc.	80.0
RVP	3.5

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE XVIII

ESTIMATED HEAVY NAPHTHA PLATFORMING YIELDS

Charge	°API	B/D	Vol.%	Lbs/Hr	Wt. %	Lbs/Gal
Unifined Virgin 270-450° F	45.4	7,680	57.21	89,507	57.30	6.660
Unifined Visbrkr. 270-400° F	50.2	945	7.04	10,759	6.89	6.483
Heavy Isomaxate	45.4	4,800	35.75	55,942	35.81	6.660
	45.8	13,425	100.00	156,208	100.00	

Yields				
H_2			1,968	1.26
C_1			3,452	2.21
C_2			4,421	2.83
C_3			5,967	3.82
C_4's	772	5.75	6,483	4.15
C_5's	765	5.70	7,014	4.49
Hexanes+	10,341	77.03	126,903	81.24
	11,878	88.48	156,208	100.00

Deprop. Bottoms - C_4+ Platformate

	B/D	°API	RVP	F-1 Cl.	F-1+3cc.
Total Bottoms	11,586	42.1	6.07	94.9	99.8

Platformate Split

	°API	B/D	Vol.%	Lbs/Hr	Wt. %	Lbs/Gal
C_4-390° F Platf.	48.8	9,653	83.3	110,384	80.23	6.534
390 E.P. Platf.	15.0	1,933	16.7	27,205	19.77	8.044
	42.1	11,586	100.0	137,589	100.00	6.786

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE XIX

ESTIMATED NAPHTHALENE HYDEAL YIELDS

Charge	°API	B/D	Vol.%	Lbs/Hr	Wt. %	Lb/Gal
Hvy. Platformate	15.0	1,933	100.0	27,205	100.0	8.044
H_2(710 SCF/100#)	-	-	-	1,027	3.78	-
				28,232	103.78	
Yields						
Benzene	28.3	546	28.3	7,074	26.00	7.375
Naphthalenes				11,430	42.00	
Hvy. Aromatics	31.0	65	3.3	817	3.00	7.251
Fuel Gas(methane)				8,918	32.78	
				28,239	100.00	

Fuel Gas*- 1,840 bbl F.O.E.

*Fuel gas containes components both from Hydeal operations and the heavy naphtha Platformer separator gas.

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE XX

ESTIMATED GAS CONCENTRATION UNIT YIELDS

	Crude Lbs/Hr	Hvy.Nap. Platf. Lbs/Hr	B-T-X Platf. Lbs/Hr	ISOMAX Lbs/Hr	Visbkr. Lbs/Hr	Total Lbs/Hr	Fuel Gas Lbs/Hr	BTU/Lb	Recovered Lbs/Hr	Recovered B/D
H_2	-	37	23	-	28	88	88	61,029	-	
C_1	-	401	27	1,162	899	2,489	2,489	23,886	-	
$C_2^=$	-	-	-	-	365	365	365	21,639	-	
C_2	-	1,302	440	1,162	1,207	4,611	4,611	22,325	-	
$C_3^=$	-	-	-	-	1,151	1,151	173	21,047	978	128
C_3	2,890	4,038	1,831	3,680	1,488	13,927	2,089	21,664	11,838	1,597
$C_4^=$	-	-	-	-	1,769	1,769	35	20,766	1,734	196
iC_4	222	313	343	5,917	534	7,329	11	21,239	7,318	890
nC_4	510	383	238	3,186	702	5,019	14	21,301	5,005	588
	3,622	6,974	2,902	15,107	8,143	36,748	9,875		26,873	3,399

Recovery Factors

C_3's 85%
C_4's 98%

Fuel Gas: 860 bbl F.O.E.

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PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE XXI

ESTIMATED GASOLINE POOL

Components	B/D	Vol. %	F-1 Cl.	F-1+3cc	RVP
Lt. St. Run	3,404	26.1	78.5	96.0	26.00
C_4-390° F Platformate	9,653	73.9	92.5	98.6	5.50
	13,057	100.0	88.4	98.0	10.0

T.E.L. requirement to meet pool octane of 95.7 = 1.2cc T.E.L./Gal

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

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TABLE XXII

ESTIMATED H_2 PRODUCTION AND CONSUMPTION

Production

B-T-X Platformer	9,020 B/D x 729 SCF/Bbl	=	6.6 x 10^6SCF/D
Hvy. Nap. Platformer	13,380 B/D x 647 SCF/Bbl	=	8.7 x 10^6SCF/D
Hydrogen Plant		=	30.0 x 10^6SCF/D
			45.3 x 10^6SCF/D

Consumption*

Lt.Nap.Unifiner	5,910 B/D x 108 SCF/Bbl	=	0.6 x 10^6SCF/D
Hvy.Nap.Unifiner	8,580 B/D x 117 SCF/Bbl	=	1.0 x 10^6SCF/D
No.2 F.O.Unifiner	11,880 B/D x 126 SCF/Bbl	=	1.5 x 10^6SCF/D
Hydeal Unit	1,933 B/D x 4498 SCF/Bbl	=	8.7 x 10^6SCF/D
Isomax Unit	14,220 B/D x 2150 SCF/Bbl	=	30.6 X 10^6SCF/D
			42.4 x 10^6SCF/D

*Consumption includes chemical and solution losses.

OVERSIZE FOLDOUT(S) FOUND HERE IN THE PRINTED EDITION OF THIS VOLUME ARE FOUND FOLLOWING THE LAST PAGE OF TEXT IN THIS MICROFICHE EDITION

SEE FOLDOUT NO 1

P-219, Establishment of a Core Chemical Industry in Puerto Rico

E 1295

ESTABLISHMENT OF A CORE CHEMICAL INDUSTRY IN PUERTO RICO

Report

~~Jan. 1964~~

BEST COPY AVAILABLE

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E 1296

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REPORT IN BRIEF

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REQUEST FOR OIL IMPORT ALLOCATION

PUERTO RICO OIL & PETROCHEMICAL COMPANY

San Juan, P.R. - New York, N.Y.

June, 1963

E 1300

REPORT IN BRIEF

The purpose of this report is to outline the project for a petrochemical core industry as an essential part of the economic development of Puerto Rico, and to request an oil import allocation to establish this new industry.

NEED FOR A PETROCHEMICAL INDUSTRY

The economy of Puerto Rico will benefit by the establishment of a company whose express purpose is the development of a petrochemical industry.

Recent industrial development on the Island has resulted in the employment of primarily female labor. It is now urgent that new industry be directed towards the employment of male labor.

This industry will be the means by which a critically depressed area will be transformed into a strong, economic community.

A petrochemical industry will provide a major construction program; a major area development; an immediate petrochemical feed plant; and future petrochemical plants. This program is all based on continuing growth in this area of construction, operation, and new development in a continuing growth cycle, including support industries.

A petrochemical industry will compensate for the lack of indigenous raw materials on the island and will revive interest by U.S. chemical companies in establishing subsidiaries in Puerto Rico.

(See Chapter I)

CORE PLANT REQUIRED

The growth of a petrochemical industry depends upon a core plant to supply petrochemicals and chemical feed stocks. These products will compensate for the lack of natural resources and will provide raw materials for a petrochemical industry.

From a practical standpoint and in order to be economic, the plant must also recover and market the residual petroleum products which will be quite substantial, particularly in the early stages of operation, while additional petrochemical outlets are being developed.

The core plant is not to be a static specific refinery or petrochemical plant, but a flexible petrochemical raw material feed plant which will continue to supply additional petrochemical raw materials as they can be used.

The establishment of a core plant of this type is therefore the essential first step in the establishment of a growing petrochemical industry in Puerto Rico.

(See Chapter II)

ACTION BY COMMONWEALTH OF PUERTO RICO

To implement the establishment of this project, the Commonwealth of Puerto Rico has agreed to clear and provide land, housing facilities,

necessary building permits, assistance for support industries, port installation at Mayaguez, and other necessary related facilities.

The Commonwealth has stated that this project is of the highest economic priority, should proceed with utmost dispatch, and has their full support.

(See Chapter III)

COMMERCIAL IMPLEMENTATION

The purpose of the Puerto Rican Oil and Petrochemical Company is stated in the first paragraph of its charter, as follows:

> "The company is formed for the express purpose of developing a chemical and petrochemical industry in Puerto Rico. It will design and build a refinery to produce, initially, sulfur, aromatic petrochemicals and petroleum products. This refinery will be the basis of and feed plant for the petrochemical industry as it grows. The refinery will be designed so that petrochemical side streams can be withdrawn in the future. When these side streams are needed, the company will install the necessary additional facilities to purify them. The company will also promote additional chemical and petrochemical projects related to the development of the petrochemical industry."

Arrangements have been made with Phillips Petroleum Company to supply crude oil and to market the petrochemical and related petroleum products.

Sulfur will be marketed by PROPCO.

Monsanto Chemical Company has identified its interest in a chemical feed stock of high wax content.

Other petrochemical companies have expressed their interest in feed stocks for different petrochemical end products. These will be pursued and developed as soon as an oil import allocation is authorized.

A fueling station is planned for ships passing through the Mona Passage. This will be available to supply both commercial and military vessels.

In addition to providing a core industry necessary for the basic economic growth and development of Puerto Rico, the proposed company will place many American companies who wish to participate in a strong position to compete for world business.

PROPCO also proposes to build a satellite plant adjacent to the core plant to produce lead antiknock additives.

PROPCO dollar sales volume is expected to be 53% petrochemical and "non-quota" petrochemical fuels initially. As satellite petrochemical plants are built, the ratio of petrochemical sales will, of course, increase.

(See Chapter IV)

ENGINEERING PLANNING

E 1305

Universal Oil Products Company has made a site investigation and has worked up a preliminary set of plans for the refining of Venezuelan crude to produce aromatic petrochemicals and petroleum products.

In order to be practical from an economic and marketing standpoint, these plans have been drawn up so the core plant will start up and operate with a minimum of difficulty, yet be so designed that side streams can be withdrawn for the separation and purification of petrochemicals as markets are developed or as they can be used by other companies for chemical feed stocks.

These plans include both capital and operating cost estimates, site recommendations, personnel requirements, and an estimated net operating income.

(See Chapter V)

FINANCIAL PLANNING

On the basis of the Universal Oil Products Company's engineering investigation, representatives of E. M. Warburg Company and Kuhn Loeb have worked up a financial plan for this project. This plan provides for maximum participation by citizens of Puerto Rico.

(See Chapter VI)

STATUS OF PROJECT E 1306

Preliminary planning, selection of key personnel, and all other practical steps have been completed to initiate the project. Necessary assurances have been given to and received from the Commonwealth of Puerto Rico, and raw material supply and marketing arrangements have been made.

Before the construction of the core plant can be contracted, it is necessary to establish that crude petroleum will be available for the use of the company. Under the proclamation of March 10, 1959, "adjusting and Regulating Imports of Crude Oil and its Principal Products into the United States," there was a finding that...

> "The Commonwealth of Puerto Rico largely depends on imported crude oil...and that...the adjustment of imports...should permit imports into Puerto Rico adequate for the purposes of local consumption, export to foreign areas; and limited shipment of finished products to the Continental United States."

For reasons previously outlined, the need of a petrochemical industry for the Commonwealth has been given top priority in the economic development program.

The project needs only a license to import crude oil as raw material for its core plant to become a reality.

REQUEST FOR ALLOCATION

E 1307

A request for the allocation of 60,000 barrels per day of crude oil under the import quota allowance is hereby respectfully requested in order to proceed with this project for the establishment of a petrochemical industry in Puerto Rico.

# # #

CHAPTER I

NEED FOR PETROCHEMICAL INDUSTRY

Until recently the growth of the chemical industry in Puerto Rico has progressed rapidly. This progress has been remarkable because of the lack of natural resources on the island. A start has been made in petrochemicals by Union Carbide Caribe and Caribe Nitrogen with the manufacture of ethylene glycol and ammonia respectively.

However, recent plans for additional petrochemical plants have been either postponed or abandoned, and it is apparent that raw materials not otherwise available must be imported and extracted from petroleum.

The natural resources of Puerto Rico have been investigated* and found to be practically non-existant, except for sand, limestone, salt water, fresh water and sunshine. With fertile soil and fertilizer, sugar and its products are produced. This means the available raw materials for a chemical industry are sand, limestone, salt and sugar. Other materials must be imported or extracted from petroleum by a petrochemical industry.

The products which can be extracted from petroleum when combined with the products which can be produced from the other raw materials can form the basis of a thriving and continually growing chemical and

petrochemical community.

Recent industrial development on the island has been primarily in industries requiring female employment. Male employment has increased to some degree, but unemployment among men is still over 10%. Many of the unemployed are high school graduates who are ready and willing, but unable to find work.

The chemical and petrochemical industries are among the most rapidly growing industries today primarily employing male labor. The petrochemical industry is growing faster than the balance of the chemical industry and is accounting for the majority of the new investment in the chemical industry. In the period 1959 through 1961 approximately $3 billion was spent by the chemical industry for new plant construction. Of this, 61.4% was for petrochemical plants, 12.9% related to petrochemicals, and only 25.7% was for non-petrochemical construction.

In 1955 petrochemical production amounted to approximately 15 million tons, and in 1965 it is estimated to be over 40 million tons.

Concurrent with the establishment and growth of such an industrial community will be the redevelopment of a critically depressed area, the employment of male labor, and the establishment of support industries in related fields. This activity will require a continuing need for construction labor as well as predominantly male operating labor as each facility is completed.

The establishment of substantial communities, based upon support industry in the forms of machine shops, pipe shops, metal fabricating and welding shops, and electrical repair shops will also all result in increased male employment.

The need for a petrochemical industry in Puerto Rico is expressed in a report dated September, 1961, by the Commonwealth of Puerto Rico Office of Economic Research, entitled "The Chemical and Allied Products Industry in Puerto Rico"** and quoted in part below:

> "There are several reasons why great importance is attached to the need for an expanding petrochemical industry...
>
> 1. A local petrochemical industry could substantially compensate for the island's lack of indigenous raw materials.
>
> 2. The industry affords permanent employment at relatively high wages.
>
> 3. The industry offers predominantly male employment; an offset to the fact that new employment opportunities generated by our development program to date have been largely female jobs (60%).
>
> 4. Because of the magnitude of petrochemical projects, a substantial volume of constructive employment and income is generated in the adjoining areas."

When this report was written, the following chemical and petrochemical projects were contemplated:

Polyethylene by Union Carbide Caribe

Naphthalene by Commonwealth Oil

Phthalic Anhydride by Stepan Chemical

Chlorine & Caustic Soda by Morton Chemicals

These projects have all been either postponed or abandoned. Some have been carried out elsewhere.

Other petrochemical projects recently abandoned or postponed are listed below:

Polyethylene by U.S.I. Chemical Division of National Distillers

Lead Antiknock Plant by Stepan Chemical

These projects may be revived by these same companies or by others if a petrochemical industry is established to provide feed stocks and/or markets for them.

New opportunities are constantly arising. As for example, the Puerto Rico Chemical Company has just announced plans for a 5,000,000 pound per year phthalic anhydride plant. Representatives of this company have told us that the feed stock they require is not available in Puerto Rico and that they must import their requirements. The feed stock they require is one of the petrochemicals we intend to manufacture in more than adequate quantity for their requirements.

The potential petrochemical complex is shown by a series of charts (No. 1 through 10) prepared by the Ralph M. Parsons Engineering Company. Chart 1 shows the primary products (petrochemical intermediates) which can be made and is the index to the other nine charts.

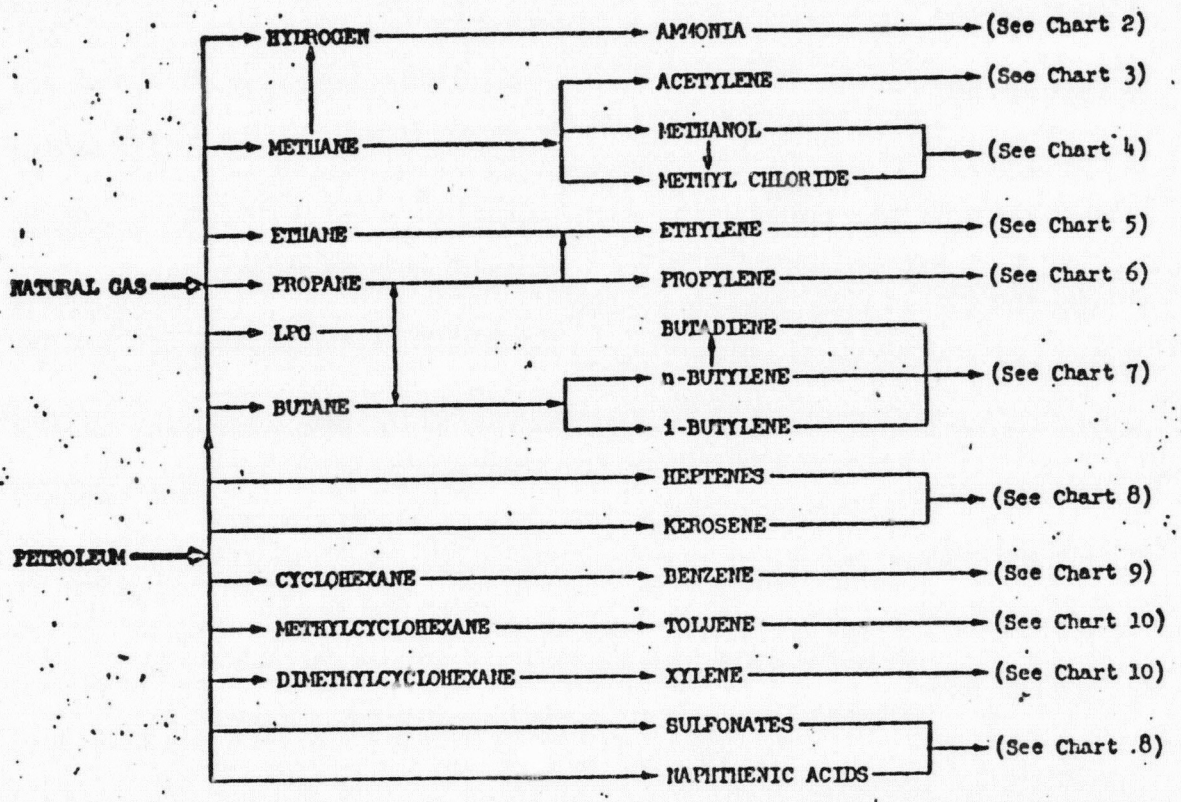
On Chart 1 the top six primary products can be made from either petroleum or natural gas; the lower products can be made only from petroleum.

The company intends to make the petrochemical products which can be made only from petroleum at first. These are the aromatics and the products which can be made from them are shown in Charts 8, 9, and 10.

The end products will eventually range from insecticides, herbicides, and solvents from the chlorinated hydrocarbons to synthetic fibers and film of the "Nylon," "Dacron," and "Mylar" type. The former will supply agricultural and dry cleaning industries and can be further processed chemically to make other chemicals such as Freon, which is used extensively in air-conditioning systems and as an aerosol propellent. The latter is only representative of one of the types of products which can be made. Nylon is the best material for commercial fish nets which could be manufactured for export and to supply the fishing vessels which supply the islands canneries. The list of possible products is beyond the scope of this report, and several volumes would be required for a complete listing of all possible future outlets.

CHART 1

MAJOR PETROCHEMICAL INTERMEDIATES



THE RALPH M. PARSONS COMPANY

CHART 1

E 1313

E 1313

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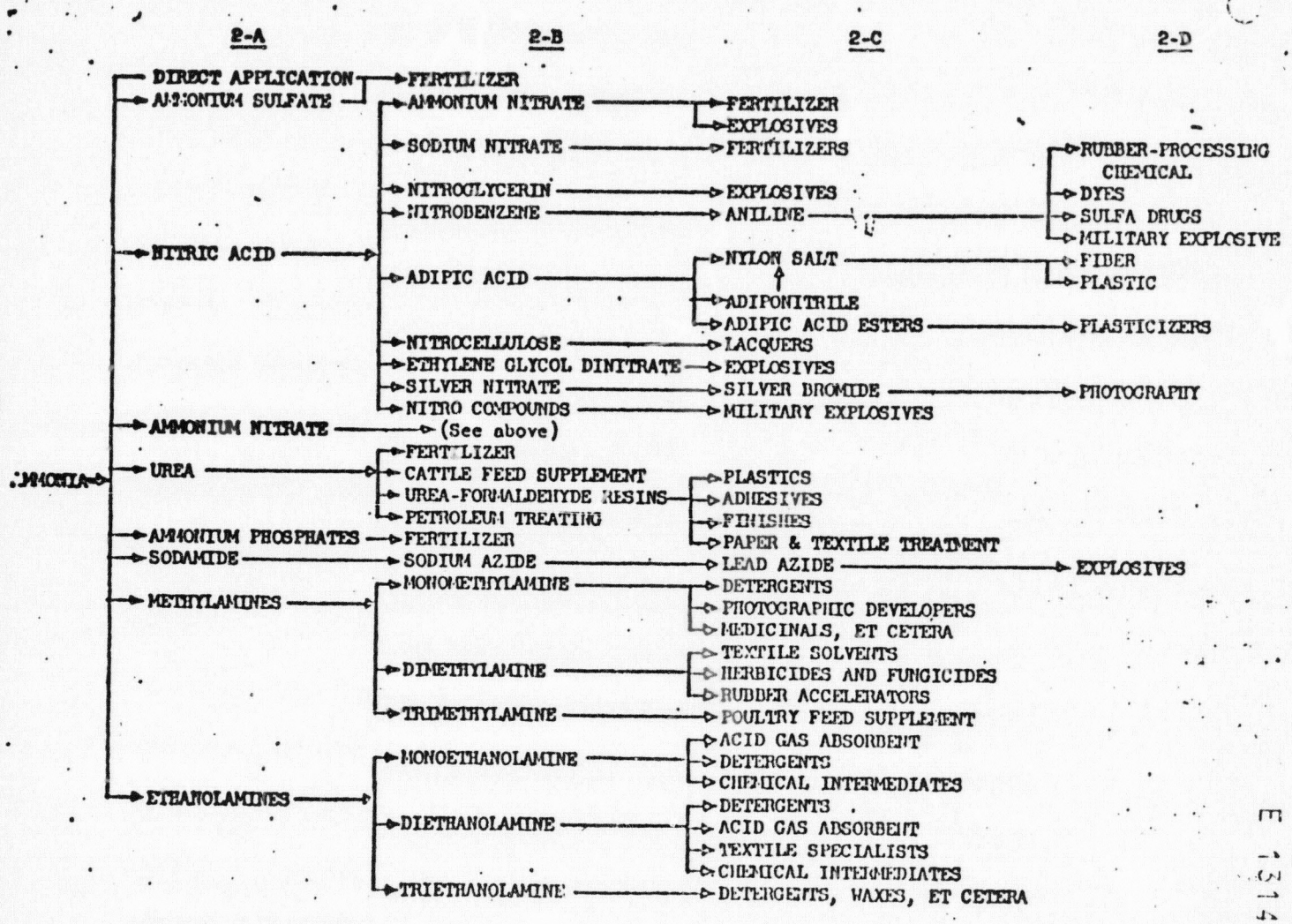


CHART 2
AMMONIA DERIVATIVES

THE RALPH M. PARSONS COMPANY

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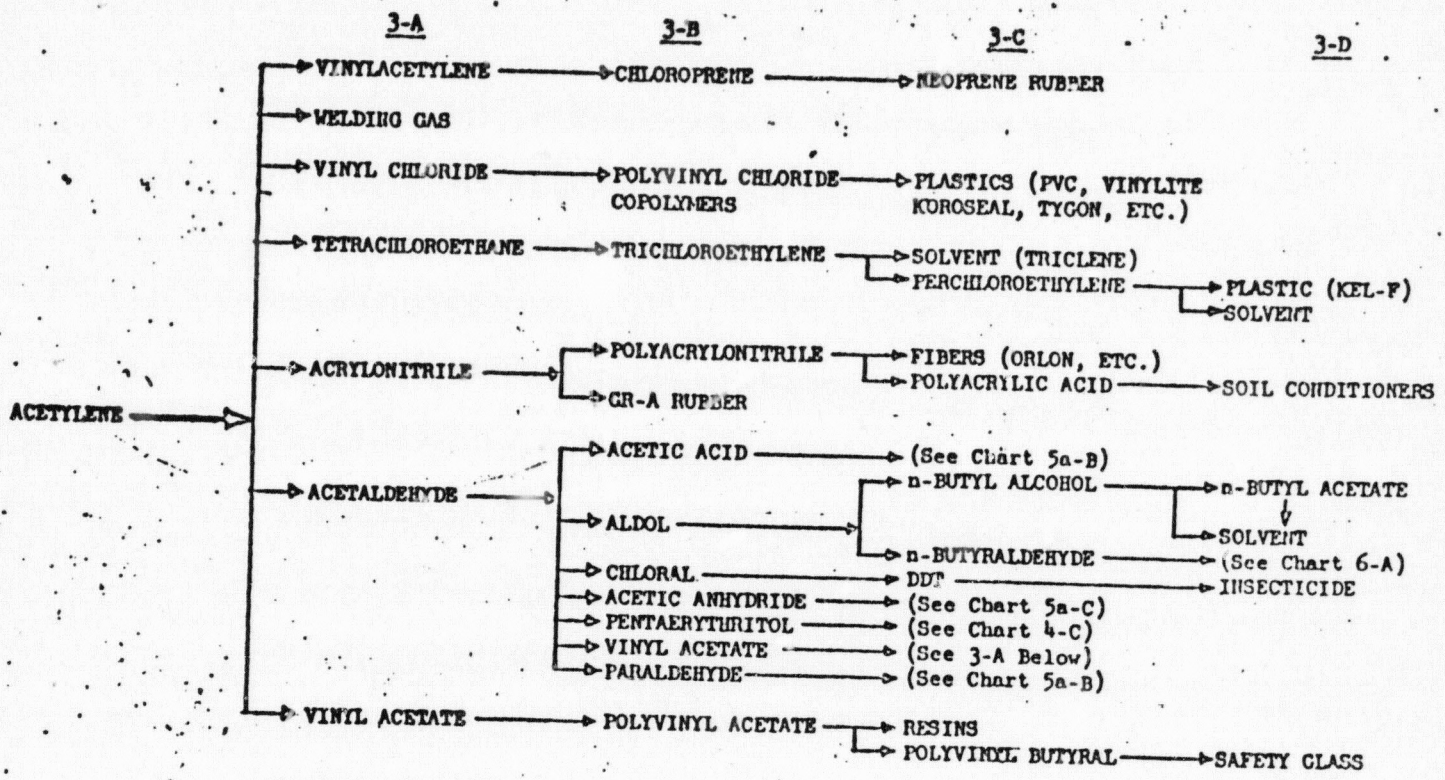


CHART 3
ACETYLENE DERIVATIVES

THE RALPH M. PARSONS COMPANY

EB15

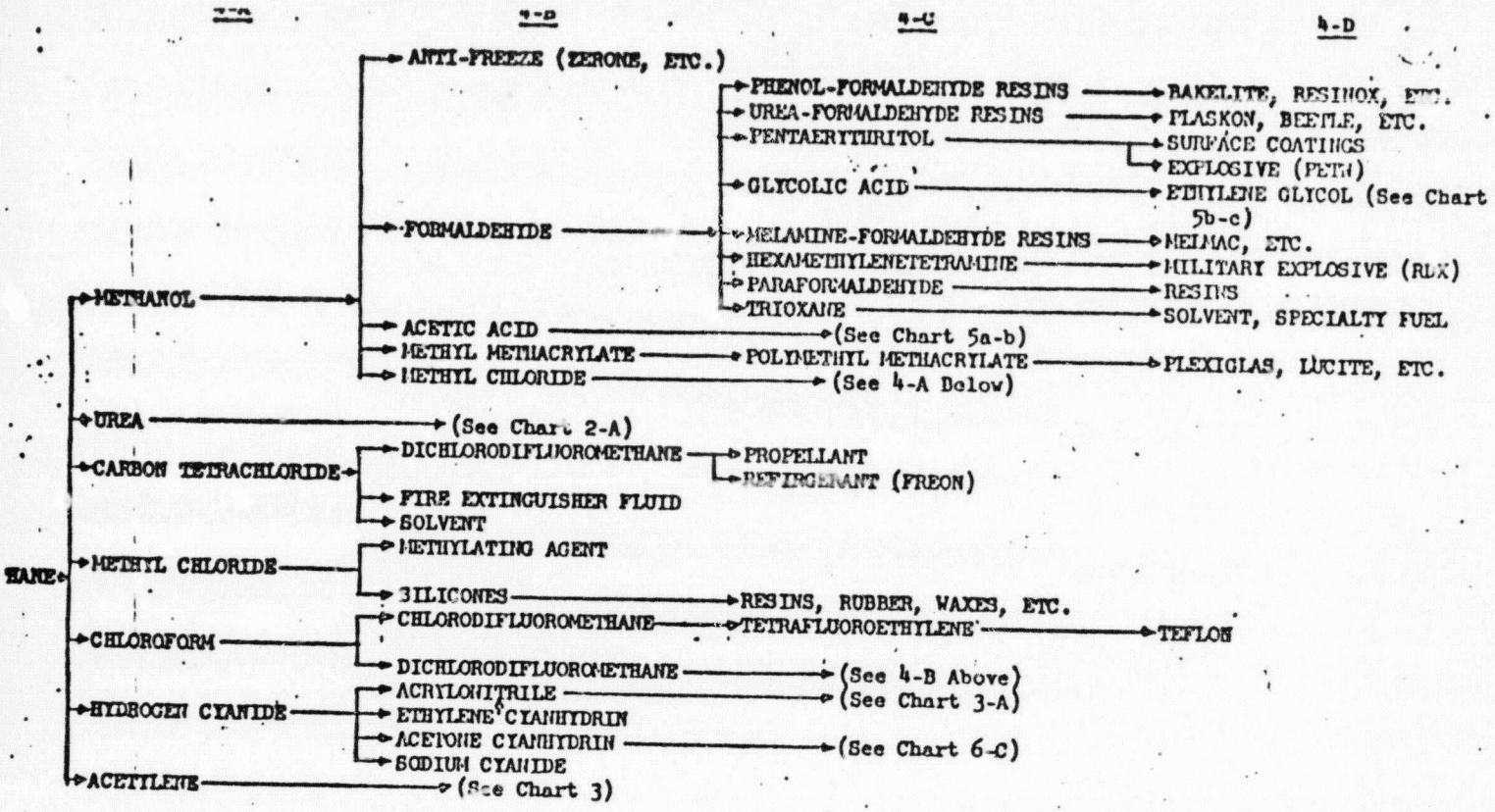


CHART 4
METHANE DERIVATIVES

THE RALPH M. PARSONS COMPANY

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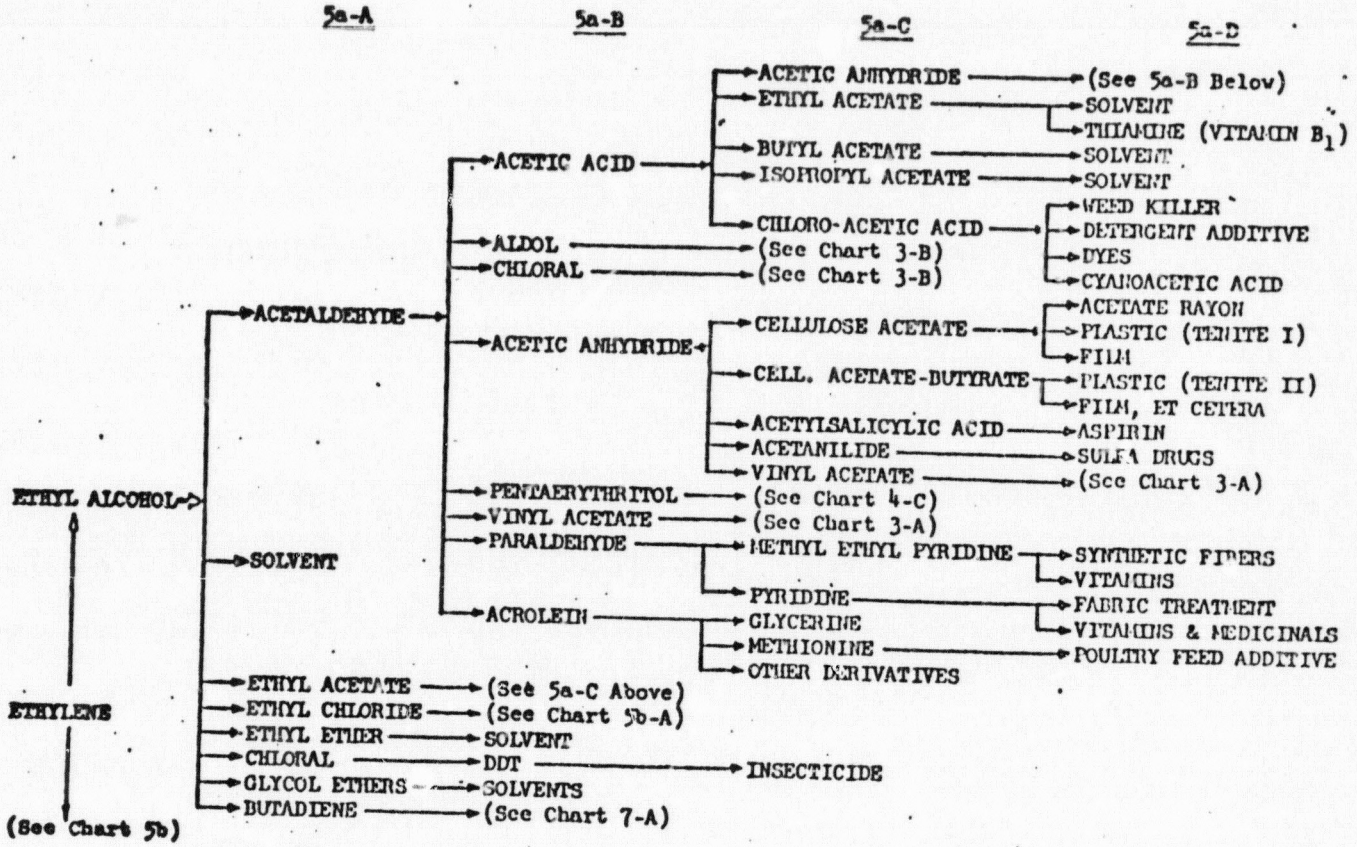


CHART 5a
ETHYL ALCOHOL DERIVATIVES

THE RALPH M. PARSONS COMPANY

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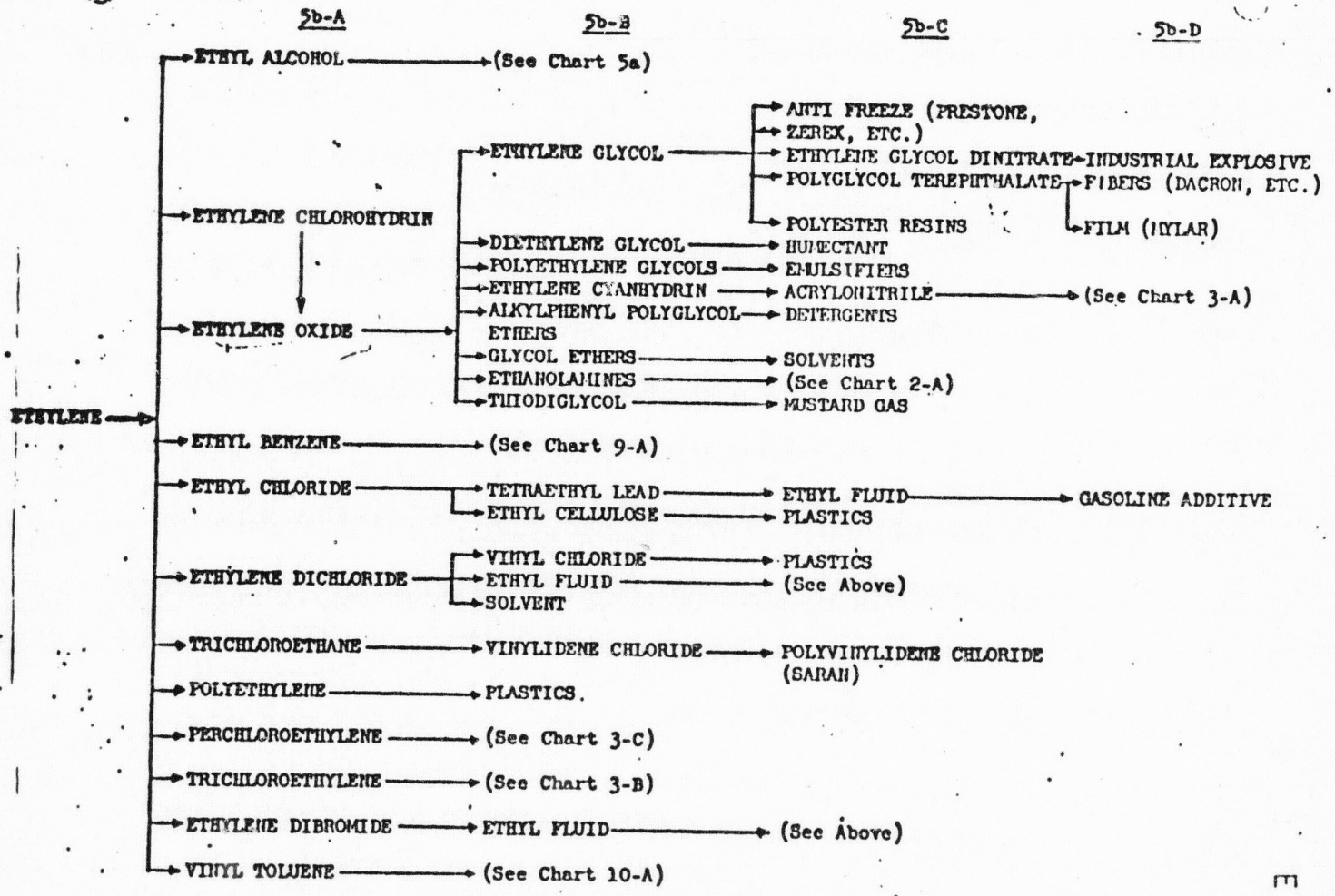


CHART 5b
ETHYLENE DERIVATIVES

THE RALPH M. PARSONS COMPANY

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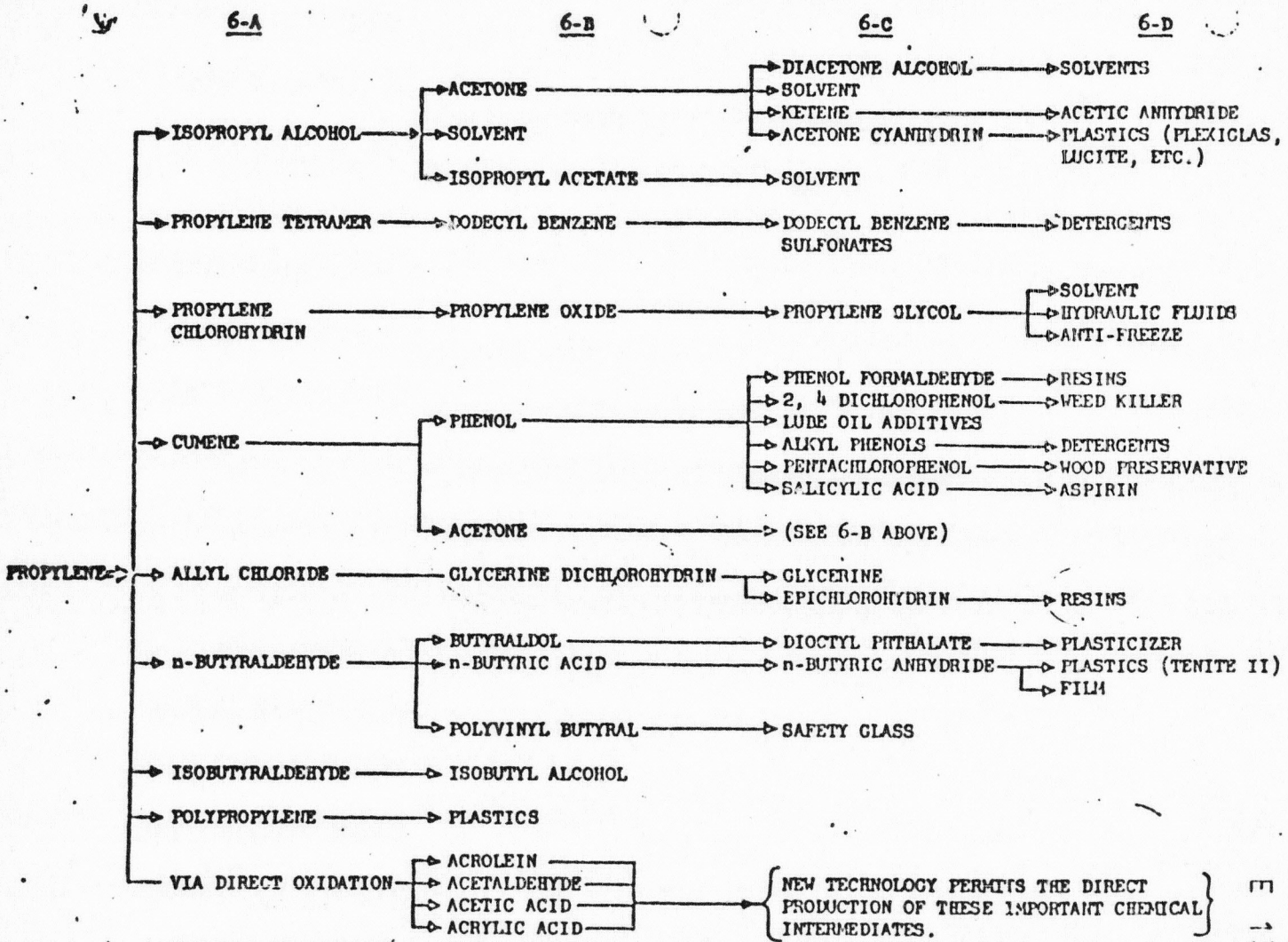


CHART 6
PROPYLENE DERIVATIVES

THE RALPH M. PARSONS COMPANY

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E 1319

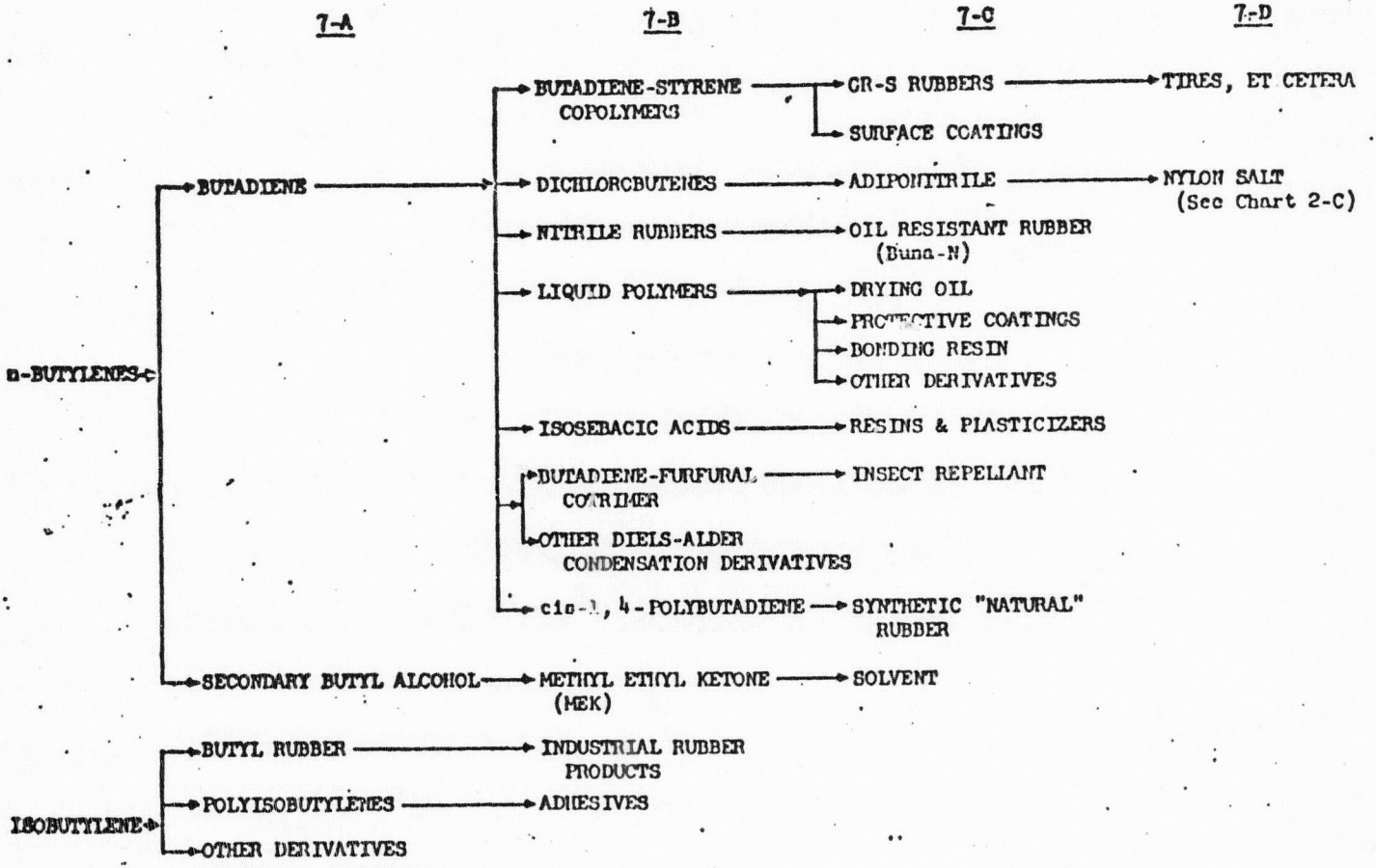


CHART 7
BUTYLENE DERIVATIVES

THE RALPH M. PARSONS COMPANY

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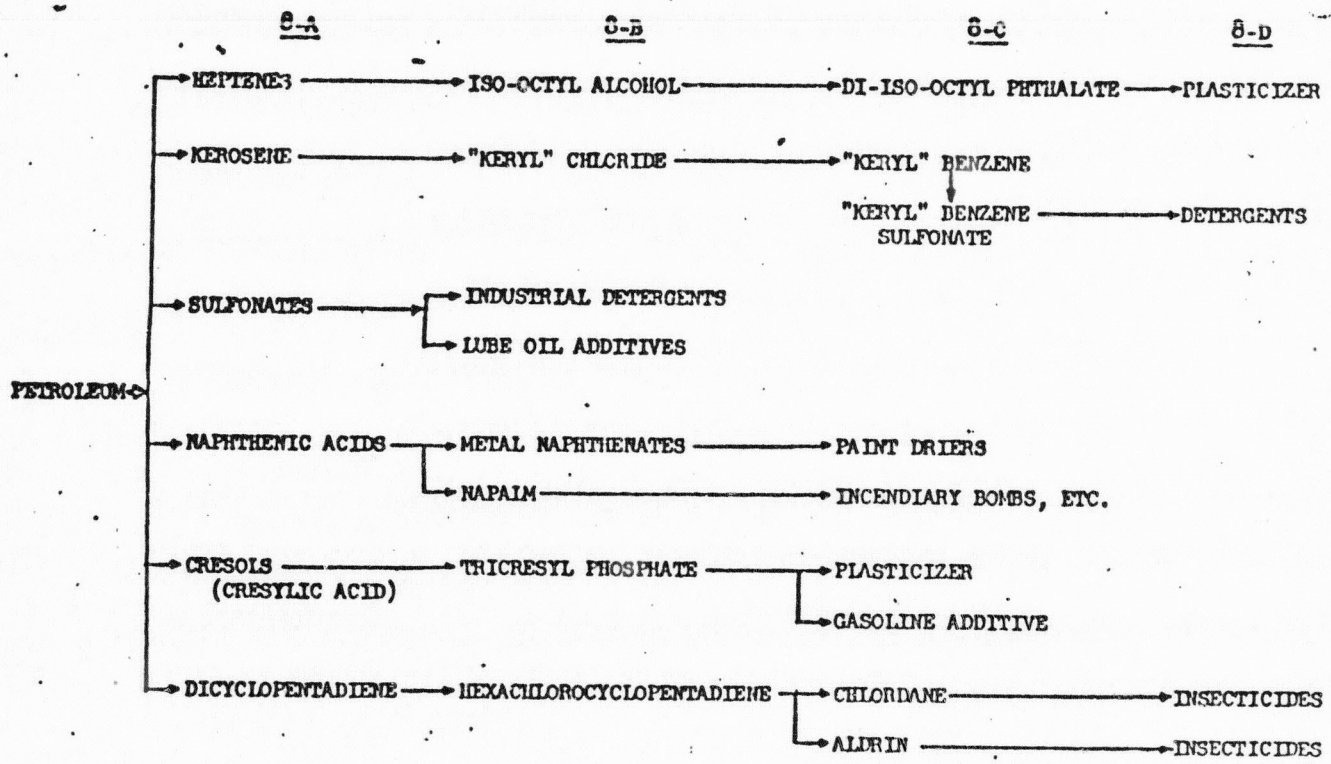


CHART 8
OTHER PETROLEUM DERIVATIVES

THE RALPH M. PARSONS COMPANY

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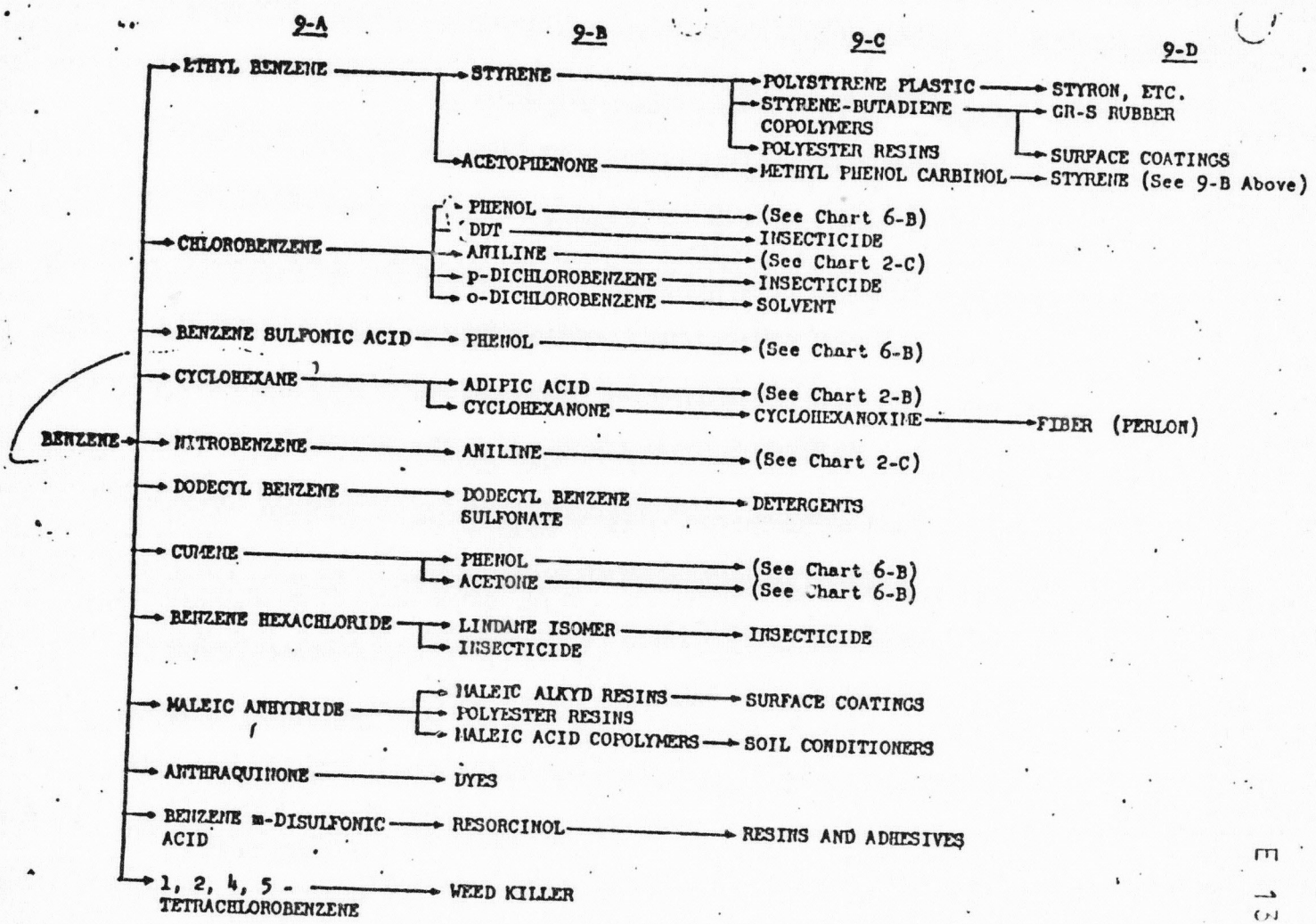


CHART 9
BENZENE DERIVATIVES

THE RALPH M. PARSONS COMPANY

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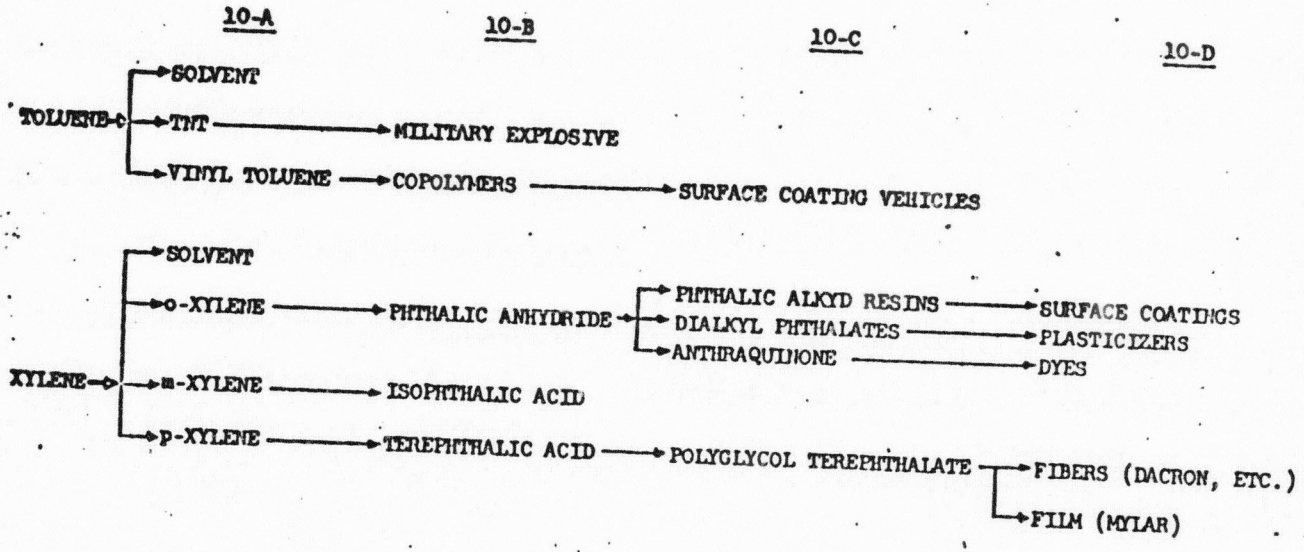


CHART 10
TOLUENE AND XYLENE DERIVATIVES

THE RALPH M. PARSONS COMPANY

E 1323

E 1323

CHAPTER II

E 1324

CHAPTER II

CORE PLANT

The first step in the development of a petrochemical industry is to establish a core plant to provide feed stocks and petrochemicals for the prospective petrochemical plants. The latter would be essentially satellites around the core plant which will extract and purify each raw material for each respective satellite plant.

Obviously, the entire complex of core plant and satellites cannot be established at once, but must be developed over a period of time. The question of where and how to start on a practical basis is thus presented.

A core plant is proposed to refine crude oil to produce sulfur, aromatic petrochemicals, chemical feed stocks, and residual petroleum products. This plant would be designed in such a manner that side streams can be withdrawn and additional petrochemicals and chemical feed stocks separated and purified as soon as markets can be developed or agreements reached for satellite plants. In this way the quantity of petrochemicals will increase and the petroleum fuels will decrease as the petrochemical industry grows.

Some LPG will also be made, and the balance of the products will be made as soon as demand can be developed.

Sulfur is not normally considered a petrochemical because it usually occurs naturally and is one of the basic chemical building blocks. However, because of no known deposits in Puerto Rico, sulfur is now imported. Since crude oil contains small amounts of sulfur, a sulfur recovery unit is planned as part of the core refinery.

Salt recovered from the ocean by solar evaporation is available from both the southwestern part of Puerto Rico and from other nearby islands. Salt is the raw material required for two other basic chemicals: chlorine and caustic soda.

It is expected that a chlorine and caustic soda plant will be built as soon as the plans for the core plant are announced. Chlorination and sulfonation of petroleum products plays a large part in the petrochemical industry and, together with existing requirements for chlorine, caustic soda and sulfuric acid, will certainly create sufficient demand for the establishment of these basic chemical industries.

The key then to a chemical and petrochemical industry in Puerto Rico is a core plant which is established for the express purpose of extracting chemicals, chemical feed stocks, petrochemicals, fuels and other petroleum products from crude oil. This plant is not just another refinery,

but a plant which is the first step in the development of a petrochemical industry and which is part of a company which is committed to a policy of continuing its effo[illegible] in the growth of a chemical and petrochemical industry for Puerto Rico.

# # #

CHAPTER III

E 1328

CHAPTER III

SUPPORT OF THE COMMONWEALTH

In August, 1961, after an extensive survey of the chemical industry in Puerto Rico, the Economic Development Administration of the Commonwealth made it known to representatives of the company that a core plant for a petrochemical industry was sorely needed to provide raw materials otherwise not available for that industry. Representatives of E.D.A. have made this known to the Department of the Interior. They have started construction of port facilities in Mayaguez. They have agreed to clear and provide land for the core plant and set aside other land nearby for the satellite plants. They have agreed to provide housing, roads, and to redevelop a critically depressed area. They have agreed to assist support industries to provide services for the core plant and satellite plants. In essence, they have agreed to provide or assist in all items other than those facilities to be used solely by the core plant.

The Commonwealth has described the project for the establishment of a core plant for a petrochemical industry "as of the highest economic importance," and has requested that it move ahead "with dispatch."

# # #

CHAPTER IV

COMMERCIAL IMPLEMENTATION

The Puerto Rico Oil & Petrochemical Company (PROPCO) has been incorporated in the Commonwealth of Puerto Rico by both Puerto Rican and United States parties for the express purpose of building a core plant for the development of a petrochemical industry. Its intent in this regard is contained in the first paragraph of its charter, as follows:

> "The company is formed for the express purpose of developing a chemical and petrochemical industry in Puerto Rico. It will design and build a refinery to produce, initially, sulfur, aromatic petrochemicals and petroleum products. This refinery will be the basis of and feed plant for the petrochemical industry as it grows. The refinery will be designed so that petrochemical side streams can be withdrawn in the future. When these side streams are needed, the company will install the necessary additional facilities to purify them. The company will also promote additional chemical and petrochemical projects related to the development of the petrochemical industry."

In the event that any particular petrochemical feed stock cannot be produced economically, the company has agreed to produce any such petrochemical feed stock on a quasi-public utility basis.

Directors of PROPCO include qualified and interested parties in both Puerto Rico and the United States.

Both the officers and operating personnel of PROPCO have been selected on the basis of their proven performance in the chemical, petrochemical, petroleum and engineering and construction industries. Resume's of the Directors and Officers are attached hereto.

For the core plant to be economic and practical, raw material supply and marketing arrangements must be made.

Phillips Petroleum Company has agreed to supply crude and to market all petrochemicals and petroleum products not consumed by the petrochemical industry (See letter attached). Sulfur will be marketed by the company, probably to Caribe Nitrogen Company who now imports about three times the sulfur capacity of the core plant.

Monsanto Chemical Company has identified its interest in using 15,000 to 20,000 bbl/day of a 30% wax distillate cut if the company can meet its requirements as to quality and time (See letter attached).

Discussions have been held with Mobil Chemical, U.S.I., Division of National Distillers, Celanese Corporation, and Allied Chemical. These companies have asked to be kept informed of developments and would like to give serious consideration to building petrochemical plants in Puerto Rico if a core plant is built.

The core plant will necessarily produce petroleum fuels. To assist in marketing these outside the Continental U.S., a fueling station is planned for ships passing through the Mona Passage. This station is planned for both commercial and U.S. Naval vessels, and for tanker shipments of military fuels.

Captain O. W. Stafford SC USN Director, Purchase Division, reported at the September 21, 1962, meeting of the National Petroleum Refiners Association that $300 million is spent annually by the U.S. Navy for overseas fuels. At this same meeting, Col. R. W. Beer, USAF, Director, Planning and Comptroller Division, submitted an excellent series of charts showing details of military procurement which showed the Caribbean to be the largest single source of military tanker cargoes. Details of the reports at this meeting are attached.

he core plant is built, the company will consider building a tetraethyl lead antiknock plant large enough to supply all the antiknock requirements of Puerto Rico. Imports were over 4 million pounds in 1960* for the two existing refineries. The core plant would use an additional 1 million pounds which would make a 5 million pound antiknock plant practical.

*From data received from the Economic Development Administration of the Commonwealth of Puerto Rico.

E 1333

Initial sales volume is expected to be slightly over 50% petrochemical and "non-quota" petroleum fuels and slightly under 50% petroleum fuels which may be imported into the continental United States. As satellite petrochemical plants are built petrochemical sales will, of course, increase. A breakdown of the initial sales forecast is as follows:

Wax feed stock 30% (gross)	10%	Net
Other petrochemicals	18%	
Fuels to Military & Mona Passage vessels	25%	
Fuels to be shipped to continental U.S.A.	47%	
Total	100%	

PHILLIPS PETROLEUM COMPANY

BARTLESVILLE, OKLAHOMA

November 13, 1962

E 1334

STANLEY LEARNED
PRESIDENT

Prudential Oil Corporation
21 West Putnam
Greenwich, Connecticut

Attn: Mr. N. M. Shippee, Chairman

Gentlemen:

In connection with the Puerto Rico Oil and Petrochemical Company's petrochemical complex to be built in Puerto Rico, Phillips Petroleum Company is prepared to:

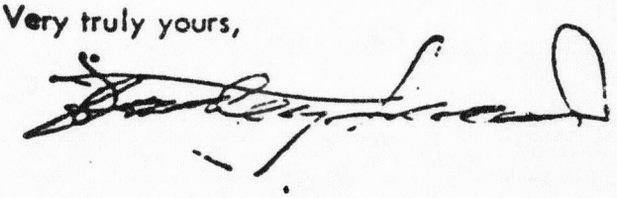
1 - Furnish 30,000 to 60,000 barrels per day of crude oil for charge stock;

2 - Purchase the refined petroleum products not consumed in the petrochemical operations;

3 - Counsel with you and assist, if you wish, in the design and construction and operation of the proposed facilities.

Whenever you desire, we shall be glad to have our representative work with you to negotiate and complete contracts.

Very truly yours,



MONSANTO CHEMICAL COMPANY
HYDROCARBONS DIVISION

E 1335

800 NORTH LINDBERGH BOULEVARD
ST. LOUIS 66, MISSOURI

November 19, 1962

Mr. E. J. Willey
Prudential Oil Corporation
21 West Putnam Avenue
Greenwich, Connecticut

Dear Mr. Willey:

Your letter of November 12 has been received.

We do have a potential requirement for a waxy feedstock for petrochemical manufacture. However, this material will be utilized in our pending project only if:

(1) Quality satisfactory
(2) Price within specified limits
(3) Availability clearly determined within next few months.

If these conditions cannot be met, our project will move in a completely different manner, involving different raw materials.

The desired waxy feedstock should:

(a) Be a 600-900°F. vacuum distillate
(b) Contain 30% wax
(c) Be as low in sulfur as possible
(d) Pass a final evaluation in our process.

If successful in "putting together" an operation based on such a feed, 15,000-20,000 bbl./day of the distillate would be required.

E 1336

We would certainly be interested in evaluating a sample of any proposed raw material. If whole crude is furnished, a five-gallon quantity would be needed; if 600-900°F. cut can be supplied (this is more desirable), one-gallon would be sufficient. In either event, sample should be shipped to:

Dr. B. L. Williams
Monsanto Chemical Company
Texas City, Texas

We should receive several weeks' advance notice on any shipments.

Your interest in working with us is appreciated; of particular interest is your statement that our pricing requirement can be met. We will look forward to hearing from you further.

Sincerely,

Norman J. Lewis

Norman J. Lewis

NJL/vc

E 1337

NATIONAL PETROLEUM REFINERS ASSOCIATION

FALL MEETING

PROCEEDINGS OF DEFENSE PETROLEUM SUPPLY CENTER PRESENTATION
(September 21, 1962)

REMARKS BY
Colonel Leon Stann
on behalf of
Rear Admiral T. L. Becknell, Jr.

DPSC'S ROLE IN PETROLEUM
Colonel R. W. Beers, USAF
Director, Planning and Comptroller Division

PROCUREMENT OF PRODUCTS
Captain O. W. Stafford, SC, USN
Director, Purchase Division

PROCUREMENT OF SERVICES
Colonel S. O. Benner, USAF
Director, Service Contracts Division

LEGAL ASPECTS OF DPSC CONTRACTS
C. F. Pollock
Counsel

Presented at the
NPRA FALL MEETING
Washington, D. C.
September 19-21, 1962

416 Beacon Building
Tulsa, Oklahoma

927 Munsey Building
Washington, D. C.

E 1338

The statements herein do not reflect the official position of the National Petroleum Refiners Association unless specifically approved by the Board of Directors. The NPRA does not restrict the publication of this paper. However, the NPRA does recommend that approval be obtained from the author before the paper is published by any trade journal. The name, location and date of the NPRA meeting at which the paper was presented should be included in the published article. Additional copies of this paper are available to members of NPRA at no additional charge.

PROCUREMENT OF SERVICES

by

Colonel S. O. Benner, USAF

E 1339

I. INTRODUCTION

In addition to buying petroleum products described by Capt. Stafford, the Defense Petroleum Supply Center buys services connected with petroleum. We procur these services on behalf of the Army, Navy, and Air Force, and we let contracts throughout the world. We presently are administering some 140 contracts: (flash slide 1) the chart shows the concentration of the 118 contracts we have in the States. I'll show you the overseas locations later.

Our buying programs cover several different types of services. They include the operation of government-owned terminals; commercial storage services; drum and container filling; laboratory testing; re-refining; aircraft refueling; and miscellaneous services, such as the blending of anti-icing additive into government owned jet fuel.

Many of you presently have service contracts with the center and are providing the Military with excellent services. Many of you are potential suppliers. In some of our programs there isn't much competition. I would like to describe the services involved in each program in hope of developing more industry interest.

II. GOVERNMENT-OWNED TERMINALS

(Flash slide 2) one of our programs is for the operation of bulk storage terminals owned by the Air Force. The contracts under this program are usually for 12 months, but with the starting dates staggered throughout the year. The contracts are let by formal advertising and are reserved for small business. We presently contract for the operation of 10 of these terminals, as shown on the chart. The terminals range in size from 100,000 barrels at Tacoma, Washington, to 1,200,000 barrels at Tiverton, Rhode Island.

In operating these terminals, the contractor performs all the services incident to receiving, storing, and shipping government-owned fuel, plus everyday housekeeping and maintenance of the facility itself. Except for the small tools required in maintenance, little fixed investment is necessary. Basically, the contractor provides the personnel necessary for all terminal operations. This might include only a terminal superintendent, several operators, and a guard.

For the operation of all 10 terminals, the government pays some $600,000 a year. At present, we have 47 companies on our mailing list for this program; but many are not active bidders. All of the contracts are presently divided among only 4 companies.

III. COMMERCIAL TERMINALS

A second buying program in the service contracts division is for storage

E 1340

services in commercially-owned bulk terminals. (flash slide 3) This chart shows the location of the eleven commercial terminals contracted for on behalf of the Navy. (flash chart 4) the dots on this chart represent the 24 single year storage contracts for the Air Force; on a later chart six terminals for the Army will be shown.

Under many of these commercial storage contracts, the government uses only one or two storage tanks, while under others we occupy the whole terminal. The government is quite flexible as to the specifications of tanks provided under commercial storage contracts.

In furnishing storage services, the contractor provides the required storage, and also handles the government-owned product as it enters and leaves the terminal. Terminal personnel are required to operate the storage being used by the government in much the same manner as the operations required in the government-owned terminals I mentioned earlier.

We let these contracts by negotiation, and any company, large or small, may participate. Prices vary considerably, depending on the size and location of the terminal, the complexity of its operation, ancillary operations, and the competition available in the area.

Though these contracts are initially let for just a 12 month period, most contain unilateral government options to renew the services for several succeeding one year periods. The procurement regulations prohibit contracts of this type for more than one year's duration.

Competition in this program is restricted geographically, since the Military service requiring the storage specified the area in which the terminal must be located. Often there is good competition; often not. At one location I visited recently nearly a dozen different companies had existing storage available. In many areas, however, we have had to look hard for suppliers.

There are presently 28 companies providing single year commercial storage services for the government. Though there are over 100 firms on our mailing lists for all locations, in most areas the likely suppliers are very few.

Most of our single year commercial storage contracts are for the use of existing storage. Occasionally, however, we have a requirement in an area where there is not sufficient existing storage. Then, in order for the contractor to perform the services necessary in providing storage for the government, he must first build the tanks. Although the contract calls for storage services only, we recognize in the negotiations the contractor's costs of construction. Of our 41 single year commercial storage contracts, 6 have some element of construction costs included in their service charges.

IV. MULTI-YEAR COMMERCIAL STORAGE

We have eight multi-year commercial storage contracts. These are the result of requirements for storage in areas where there was no existing storage and where no commercial requirements for petroleum storage were foreseen. Because of the

poor prospects for future commercial business, industry was reluctant to build terminals with only a one year guarantee of government use. On the other hand, the government did not desire to bear the entire construction cost in one year. Consequently, we secured legislation permitting firm contracts up to 5 years, provided the storage facility to be constructed met certain criteria on dispersal and hardening.

As shown on the chart, marked by diamonds, mainly across the Canadian border, there are 8 of these contracts presently in operation. The 8 terminals range in size from 90,000 barrels to 1,000,000 barrels. At present we know of no new requirements for services of this type.

V. DRUMMING

(Flash slide 5) The dots on this chart show the commercial storage sites for the Army. As indicated by the "D's", at some of these sites, there is also provided drumming and can filling services. We have 10 drumming contracts: 8 for the Army and 2 for the Air Force. The contracts are for one-year, usually, with government options to renew for several succeeding years.

In drumming, the services performed by the contractor include receiving and inspecting empty drums or cans, storing empty drums, filling drums with government product, storing the filled drums, and loading them aboard government-furnished transportation. The contracts usually provide for the government to pay for each of these services separately.

For instance, for each drum handled we might pay to receive it, so much a month to store it, and so much to fill it and load it for shipment.

Eight companies presently are providing these services for the government. Although more than 70 firms have indicated an interest in this program and are on our mailing lists, geographic factors sometimes result in little competition in some areas. In general, drumming is desired in coastal locations.

VI. LABORATORY TESTING

(Flash slide 6) We also procure laboratory testing services at commercially-owned labs for the Air Force. As indicated by the chart, we presently have contracts in the U.S. at 20 labs. These contracts are very small monetarily. They are let once a year by formal advertising.

Under these contracts, the labs perform all sorts of tests and sample analyses on government petroleum products. Some contracts provide for as many as 40 different tests. The contractor is paid for each test performed.

16 different firms presently have lab service contracts with the center. These firms vary in size from small single proprietorships to the major oil companies. Our invitations for bids are mailed to 87 companies. Even with this number of interested firms, we have trouble every year getting adequate responses to the testing IFB. This year we were unable to get lab services at 5 locations.

E 1342

RE-REFINING

A very small program is for the re-refining of government-owned used aircraft engine oil. This is primarily an Air Force program. The contracts are let by formal advertising and are re-advertised yearly. Under these contracts, the contractor re-refines used aircraft engine oil to produce grade 1100 lube oil. The services required of the contractor all take place at his refinery. There he receives used oil from government transportation, stores it in bulk storage tanks, and later re-refines it for distribution back into government petroleum stocks. We presently have only 3 contracts for these services as shown on the chart by the dots. Of the 25 known suppliers of this service, only 5 are active bidders. We would especially like to interest other companies since the Air Force's re-refining requirements, like the lab ones, are never completely met.

VII. AIRCRAFT REFUELING

(Flash slide 7) Still another of the services we contract for is aircraft refueling for the Navy. As shown on the chart, there are 25 Naval air stations across the country which have private industry refueling its aircraft. These contracts are generally for a 12 month period, although we stagger awards throughout the year. These contracts are totally reserved for small business. They are let by formal advertising.

The contracts call for the contractor, using its own tank trucks and personnel, to fill its trucks at the station fuel depot, transport the government fuel alongside the aircraft in the refueling areas, and, as required, to defuel aircraft, all as directed by the station commanding officer. This is a 24 hour a day, 7 day a week operation. The contractor is paid basically by the month for these services. Presently, there are about 16 companies actively bidding for contracts in the program. All 25 contracts are held by 10 companies. In some locations there is still little competition.

VIII. OVERSEAS

(Flash slide 8) We also have 22 contracts for services to be performed overseas, as shown on the chart. The services provided by these contracts are mostly of the same types as those performed in the States; that is: commercial storage, drumming, and laboratory testing. The contracts are let through negotiation.

Some of the overseas contracts are unusual. For example, we presently have several contracts calling for the injection of anti-icing additive into existing stocks of Air Force jet fuel.

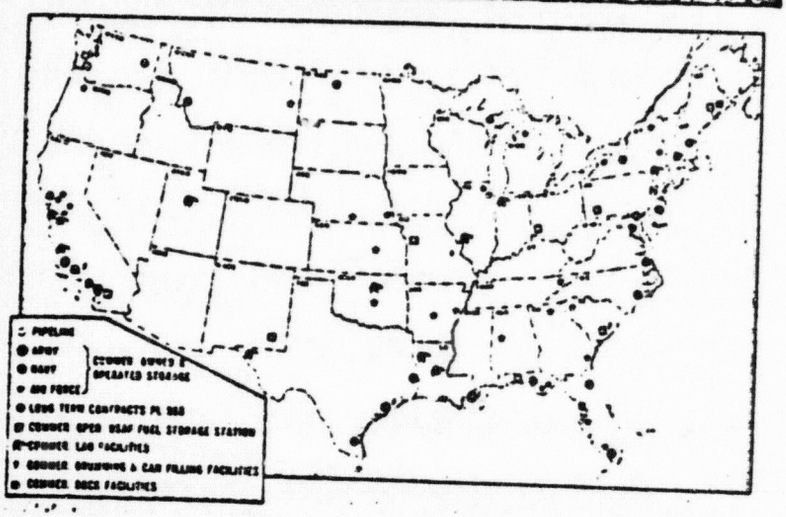
Under these contracts, the contractor provides the additive, men, and machinery necessary to inject a specified amount of additive into the fuel.

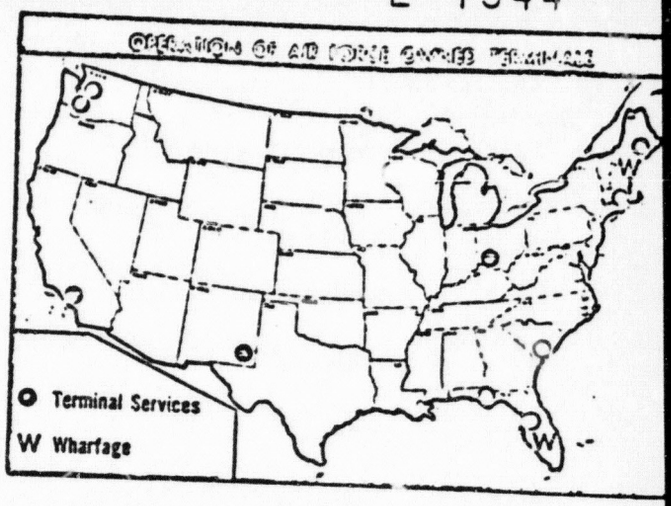
CONCLUSION

I should point out that our goal is to provide the armed forces with good

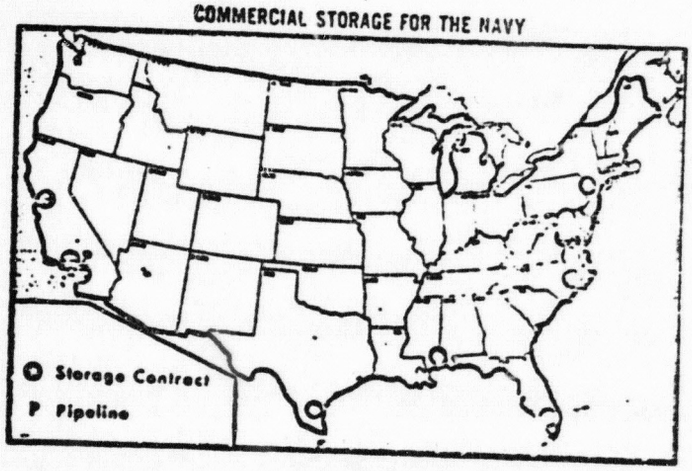
petroleum services at low cost. We've found that the best method of doing this is through competition. We welcome proposals from companies having a capability to perform any of the services I've described. The Army, Navy, and Air Force develop their own requirements. We will be glad to sound them out on any proposal from any company. We welcome letters of inquiry or visits to our offices on any matter concerning these programs. Many firms which began doing business with us in only one program are now participating in 3 or 4.

So, if your company is doing business with us now, make sure you're receiving solicitations for all our programs you are interested in. If you're not doing business with us or drop in for more information on our programs and to get on our bidder's mailing list.

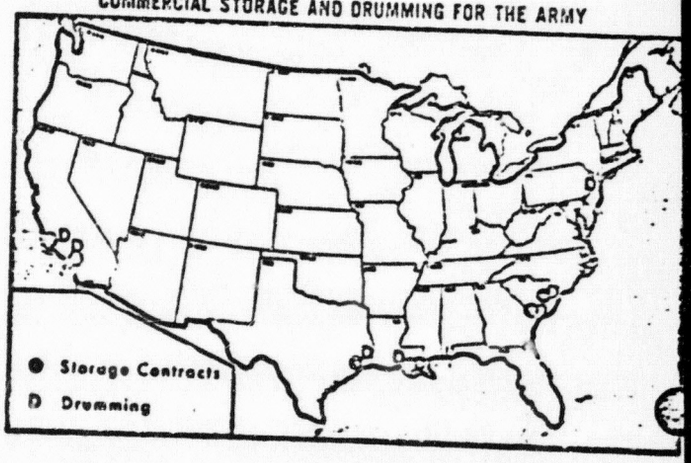




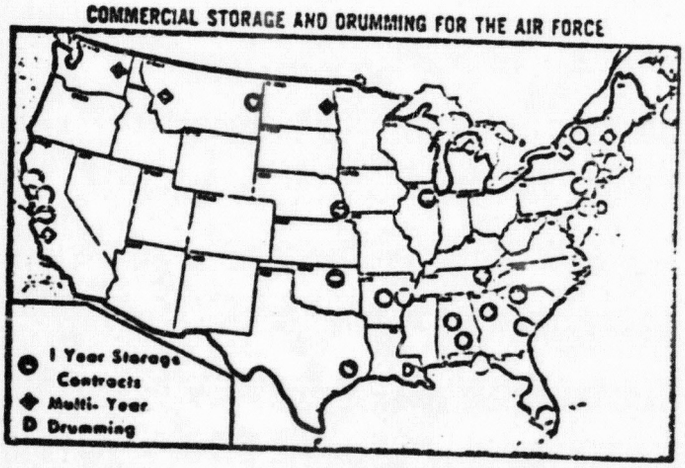
COMMERCIAL STORAGE FOR THE NAVY



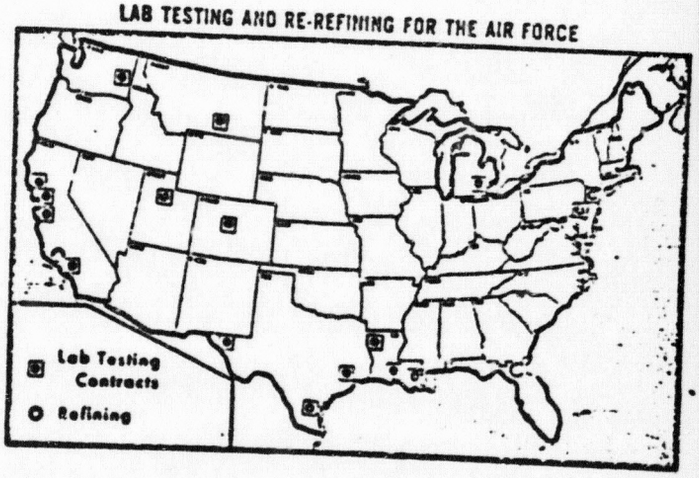
COMMERCIAL STORAGE AND DRUMMING FOR THE ARMY



COMMERCIAL STORAGE AND DRUMMING FOR THE AIR FORCE



LAB TESTING AND RE-REFINING FOR THE AIR FORCE



AIRCRAFT REFUELING AT NAVAL AIR STATIONS



SERVICE CONTRACTS - WORLD-WIDE
EXCLUDES U.S. MAINLAND AND ALASKA



LEGAL ASPECTS OF DPSC CONTRACTS

by

C. F. Pollock

E 1345

I will briefly discuss two subjects: the first being the Comptroller General's decision of last November concerning the small business set-aside program in jet fuel procurement: the second being the long range impact of government's contract terms upon industry standards.

I had hoped to be able to also comment on the nondiscrimination clause of our contracts and on the results of the compliance reports which your firms have submitted to the president's committee on equal employment opportunity. However, I must advise that I have been unable to develop sufficient information to discuss the matter today.

SMALL BUSINESS

Last November 17th, in response to a formal protest, the Comptroller General rendered an opinion as to the legality of certain aspects of our small business set-aside procedures for jet fuel procurement.

The Comptroller General considered three basic questions: First, whether partial set-asides were legally authorized by Congress. Second, whether the set-aside awards made by the Defense Petroleum Supply Center in the particular instance involved in the protest, resulted in higher prices than were otherwise available on the formally advertised portion of the procurement: and, if so, the propriety of such awards; and third, whether the "floating set-aside" principal was legally authorized.

The Comptroller General answered the three questions as follows:

On the first question, which was whether or not partial set-asides were legal, the Comptroller General said that the "Congress, by enacting section 15 of the small business act, has authorized the negotiation of partial set-asides for small business subsequent to the unrestricted formally advertised portion of a procurement." Hence, he confirmed his previous decisions and held that partial set-asides were legally authorized by the congress.

To the second question, the Comptroller General devoted 8 pages of his opinion. It is difficult to concisely brief that much material and not run afoul of possible different interpretations which some of you may have already made. So, please forgive me for slight differences which may be occasioned only by my efforts to be brief.

The second question was whether the specific set-asides in issue were awarded at prices higher than otherwise available, and, if so, the propriety of such awards.

Basically the Comptroller General held that the formula being used by DPSC in determining set-aside award prices was in accordance with past Comptroller General decisions and in conformity with authority granted to DPSC by the department

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of Defense. He said, "we do not object to the formula...so long as the total cost would not exceed what it would have been absent a set-aside." However, although he did not object to the formula used, in this case he found that the specific awards were not computed in strict accordance with the formula and that "the price at which awards were made... is in excess of the price agreed to be paid," ...on the nonset-aside portion, and, in his opinion "a downward adjustment in price with"... the two concerns awarded the set-aside "would be appropriate." In other words, he did not question the formula for determining set-aside prices but he did question the propriety of the prices in that particular instance because he felt that the formula had technically not been properly applied.

It is unlikely that the same factual situation will again occur under the new set-aside procedures now being used by the defense petroleum supply center.

The third question, you will recall, was whether the "floating set-aside" principle was legally authorized. On that third question, the Comptroller General said that the "floating set-aside" violated the rules of formal advertisement in that it did not define, with sufficient certainty, the quantities available under each item for formal competitive bidding. Further, the Comptroller felt that DPSC had used the "floating set-aside" long enough to have acquired needed information on where and how large to make specific set-asides on an item by item ba

As a result, the DPSC now uses an entirely different structure in designating set-asides. We now designate a certain quantity of various tiems as set-aside for small business. Hence on each item, the nonrestricted portion and the set-aside, or restricted, protion are fixed at the time the solicitation is forwarded to industry.

You will recall that our jet fuel solicitation each six months had been running in the neighborhood of 40 to 44 million barrels and that approximately 4 to 6 million barrels was set-aside. Actual awards to small business under the set-aside had been approximately 4 to 5 million barrels. And the total of the nonrestricted and set-aside awards to small business was approximately 9 to 10 million barrels.

It is difficult to compare results under the new set-aside procedures with results under the old floating set-aside because our procurement requirements for jet fuel have increased and are now approximately 50 to 55 million barrels each six month. Under the new procedures we have found it necessary to increase the total quantity set-aside for small business from approximately 6 million to 11 million barrels. Of the 11 million barrel set-aside, small business has accepted set-aside awards of approximately 8 million. This is a considerable increase over the 4 to 5 million awarded under the former floating set-aside. However, this increase reflects only a change in the pattern of awards and not an actual increase in overall awards to small business because the total of all jet fuel awards to small business remains at 9 to 10 million barrels. The pattern has changed in that the amount awarded on the nonset-aside portion has decreased and the amount awarded on the set-aside portion has increased a like amount with the result that the total awards of jet fuel to small business have remained essentially the same.

Notwithstanding that it has been necessary to increase the quantity set

aside to retain the same proportion of awards to small business, and, notwithstanding that the new procedure has placed an additional administrative workload on DPSC, all present indications are that the general purpose and intent of the small business act are being as well carried out under the new procedure as was originally successfully developed under the floating set-aside procedure.

IMPACT ON CONTRACT TERMS

The second item I would like to discuss is the impact of the terms of our contracts upon industry.

You are familiar with the impact which government specifications have on the type and quality of commercial product and on industry standards in general. Government specifications in time tend to become industry standards. For the most part, this has been good for the industry when considered collectively. However, with the passage of time, individual companies within the industry have found it advisable to specifically interest themselves in the continuing development of government specifications.

The point I wish to make is that what is true of government specifications is, or should, also be true of government's contract terms. We must, of course, recognize that many of our contract terms are not within your and my province to amend. Those clauses which are required by statute and executive order are essentially sacrosanct and must be included in our contracts whether or not we like them or need them. There are, however, a number of clauses which are within our authority to amend: such as those concerning delivery, inspection, acceptance and invoicing.

About five years ago, we undertook a careful study of our supply contract general provisions. The revised provisions were incorporated into a new form designated, MPSA form 77. Our plan has been to revise this form each year. To date, we have been successful in doing so.

From what I hear, the industry is accepting, as its standards, some of the terms expressed in our government contracts. I think this trend will continue because our contracts touch nearly everyone in the industry and, hence, become common ground concepts within industry. Basically, this is good. However, although these concepts can be adjusted fairly easily in their early stages: time will make them ever more difficult to amend.

I am suggesting that you and your industry have a long term stake in our contract terms. I'm sure each of you know of marketing practices to which your company is now committed that you would gladly scrap. I've even heard some of you say you would like to hang first, and then try, the fellow who came up with the idea of credit cards.

Yet, the same thing can be happening with respect to the concepts embodied in our contract general provisions. Tanker deliveries provide a case in point. Our contracts provide that, on delivery F.O.B. a tanker, the title will pass at the ship's permanent hose connection but that measurement for quantity will be

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at the suppliers' shore tanks and that inspection may be at still another point. In other words, "delivery" involves three different locations and three different points in time. What happens if there is a pipeline break between the shore tank and the ship's permanent hose connection? Could we, as a practical matter, designate one point for acceptance, measurement and passage of title? If we can, should we?

These questions and many, many others are involved in our contract general provisions. The answers we adopt have a long range impact on the industry. How can you and we get at the problem?

My suggestion is that you or members of your companies carefully and periodically review our contract terms and, from time to time, forward to us your comments and recommendations. I cannot guarantee that we will adopt any of your recommendations. It is even probable that industry comments, on any given concept, will vary from all black to all white. Naturally, we intend to adopt only that which is in the best interests of the government. However, there is a large area of common interest, and, the ideas you express on one subject may plant the seed of solution to that problem or to a problem on another subject. Without an expression of industry opinion we navigate to some extent in the dark.

In any event, I want you to understand that the Defense Petroleum Supply Center encourages industry comments on our contract provisions and that all comments will be carefully considered. One note of caution: the time to comment is before or after you submit a bid. We frown on comments submitted with your bids, and, as many of you may have regretfully learned, we are required to reject such bids as nonresponsive.

OPENING REMARKS

by

E 1349

Colonel Leon Stann, USAF

On behalf of Admiral Becknell and the Defense Petroleum Supply Center, I wish to express our appreciation for the privilege of meeting with the National Petroleum Refiner's Association. Admiral Becknell asked me to extend his sincere regrets that he is unable to attend. As you know, the Admiral is on an extended tour of temporary duty in Far East Asia.

We regard meetings such as this as a very valuable channel of communication between the Petroleum Industry and the Military. I hope that during the question and answer periods that you will feel free to raise any points that need clarification or amplification. We are here to listen and learn as well as to present information. The more thorough the exchange of information, the better equipped we will be to insure that the U.S. Military Forces are adequately supplied with the types and quantities of petroleum products they require.

I am certain that you recognize the importance of petroleum to the economies and defense efforts of the Free World; and, you need no reminder of the importance of petroleum to those countries that lie behind the Iron and Bamboo Curtains.

Our chances of success or failure in any future conflict hinge on oil. The sobering truth is that petroleum availability can make or break any military operation in modern war. With the dramatic, but still very limited exception of nuclear-powered naval vessels, the Armed Forces of all Nations are committed exclusively to hydrocarbon fuels to power their complex weapons systems.

The magnitude of military petroleum consumption is staggering by any standard of comparison. At present, our peacetime usage is running at the rate of approximately 36 million gallons a day. This is an increase of 21 million gallons a day since 1950. For example, jet fuel requirements have risen from zero 14 years ago to the present level of 17 million gallons a day. The modern military machine literally thirsts for oil. Guns, tanks, ships, planes and even most missiles need petroleum fuels and lubricants -- and in great quanitites. Concurrent with increased consumptions, there has been a gradual evolution toward greater complexity and more stringent requirements with respect to petroleum products, and their application to equipment. Materials and equipment are being stressed to their limits to meet the performance requirements of the aero-space age. Accordingly, fuels, lubricants and hydraulic fluids will have to withstand greater stresses - some known today - others to be specified in the future. Thermal stability, storage stability, cleanliness, luminometer number, BTU content, and many other characteristics are becoming increasingly important. We are continuously developing new specifications and amending existing ones. In most instances the requirement are becoming tighter. The capability of industry to produce more and better products is becoming increasingly important.

I mention these points not to impress you -- but rather to drive home the basic point that given the global commitments of the U.S. and the key importance of petroleum to support our forces, we - meaning both the Military and Industry - are faced with a tremendous logistic problem. We dare not fail, for nothing less than survival is at stake! We have depended heavily upon the petroleum industry in

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the past, and have always received outstanding support. I think it is accurate to sa that we expect to remain heavily dependent upon the Petroleum Industry as far into the future as we can presently see. I am confident that we can continue to depend on your outstanding support!

Once again I would like to express our sincere appreciation for being able to participate in this meeting.

xxx

DPSC'S ROLE IN PETROLEUM

by

Col. R. W. Beers, USAF

E 1351

The Defense Petroleum Supply Center rang in the year of 1962 with a transfer from Department of Navy to Defense Supply Agency management and our name was changed from the Military Petroleum Supply Agency to its present designation.

Since the first of January, procedures have changed but there has been no change in the basic objective of providing effective logistic support to the Military forces at the lowest possible cost to the taxpayers.

The Defense Supply Agency, or DSA to use its alphabetical short title, attempts to achieve this basic objective under the principle of decentralized operations with centralized policy and guidance. At present, DSA has two service activities - Traffic Management and Logistics, and line Commodity Supply Centers - Petroleum, Subsistence, Constructions, Medical, General Supplies, Industrial Supplies, Clothing and Textiles, Electronics Parts and Automotive Parts. These DSA field elements perform a wholesaler function for the Military Services.

To perform its mission, DSA currently employs approximately 21,000 military and civilian personnel. About 550 of them are employed in DSA Headquarters. By 30 June 1963, it is anticipated that the total employment will rise to approximately 25,300. About 1,000 will be military personnel from the four Services.

DSA Supply Centers now manage an inventory of 262,021 line items valued at 1.75 Billion dollars. This will increase to 1,200,000 items with a value of 2.6 billion dollars by the close of Fiscal Year 1963.

DSA also administers Defense-wide programs for cataloging, standardization, inter-servicing and surplus disposal which covers about 3.5 million items in the Military Supply System.

Studies to determine the range of additional items susceptible to integrated management by DSA are underway. Included are industrial production equipment, common chemical supplies and aeronautical spare parts. The total inventory value of those items is nearly ten billion dollars.

I mentioned previously that the DSA Supply Centers operate on a decentralized basis. DSA Headquarters provides overall leadership, coordinates policy and procedures and exercises the management functions related to budgeting, fiscal control and accounting, and programming.

This resumé of the Defense Supply Agency provides a bird's-eye view of the organization of which the Defense Petroleum Supply Center is a member.

Now let us look specifically at the mission, functions, and operations of the Defense Petroleum Supply Center in the world-wide petroleum logistics systems. (1) In our mission there is a definite distinction and differentiation between our scope of operations and that of DSA Commodity Supply Centers.

E 1352

First, the scope of our commodity assignment is presently limited to the extent that neither ownership nor funding by a single stock fund is provided for the management of all petroleum products. We do not compute new requirements, nor do we exercise stock financing. These functions are still the responsiblity of the individual services. However, in May 1961, the Deputy Secretary of Defense assigned the responsibility for centralized management including stock funding of packaged petroleum products, some 938 items - lubricants, grease, oil, etc. We are in the process of finalizing our procedures for this responsiblity which we will implement 1 October 1962.

Secondly, we differ in our scope of operations from other Commodity Centers in that our responsibility does not end at the waters edge of the Continental U.S. We procure, furnish services, and distribute petroleum products on a world-wide basis. I will elaborate on this later in the briefing.

(2) The principal functions assinged are to -

1. Conduct world-wide procurement of products for the Military Services and some other non-Military Government Agencies.
2. Determine source of product for Army and Navy, arrange tanker transportation and place Army/Navy bulk orders for overseas and East Coast requirements.
3. Coordinate interservice supply support (world-wide responsibility).
4. Contract for storage and services.
5. Direct the procurement inspection program.
6. Coordinate cataloging.
7. Coordinate standardization nationally and internationally (NATO).
8. Coordinate petroleum training, and
9. [illegible]s the Commodity Manager on packaged petroleum products 1 October 196[illegible]

(3) Chart on Governmental Agencies involved in petroleum

(4) DPSC Organization and Functions

To carry out our responsibilities we are presently authorized 212 civilians and 22 officers. Recently we have undergone a reorganization to afford a better posture for assumption of these increased responsibilities.

Planning and Comptroller Functions have been combined under a single division. I wish to point out that the function of industrial mobilization planning is retained by the Office of Petroleum Logistics Policy headed by Admiral Biggs.

Procurement Functions are divided between our Purchase Division, which contracts for products, and the Service Contracts Division, which contracts for services connected with storage, dispensing and testing of petroleum products, etc.

Total world-wide military petroleum requirements during Fiscal Year 1962 rose to a post World War II peak of 317.8 million barrels of product. This vast military usage is equivalent to a consumption of over 70 gallons of petroleum for each man, woman and child in the United States.

Domestic military aviation fuel consumption accounts for approximately 66 per cent of all jet fuel and 51 per cent of all aviation gasoline used in the United States.

Distribution is responsible for coordinating the management in conjunction with MSTS and the Services of bulk petroleum movements by tanker. These movements constitute approximately 50% of our procurement.

Technical. Under our Technical Division are centered the responsibilities for cataloging, standardization, procurement inspection and quality control, and technical support to the overseas commands. I feel that we have made enviable progress in standardization with an item reduction of approximately 40% since 1957.

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(5) Chart on Tanker Cargoes

This Chart depicts the magnitude of the management of tanker operations. The octopus indicates the flow of tankers. I wish to emphasize that we move product from the Caribbean and Gulf to the East Coast of the United States, and from the Gulf to the West Coast, in addition to movement to the overseas areas.

(6) Chart on Procurement

It is interesting to note, as depicted by this Chart, that because of the economic situation in oil - and we like to say as a result of better efficiency in procurement - we are buying more product for less money. The average volume over the past three Fiscal Years of products procured has been 288 million barrels per year.

(7) Chart on Distribution of the Procurement Dollar

In spending our procurement dollar, where does the money go? This Chart indicates a break-out based on volume and cost per gallon, the amount that we are currently expending of the defense dollar for procurement by major product.

(8) Chart on Trends of Fuels

We have discussed procurement from the dollar point of view, and this Chart indicates percentage-wise the amount of volume by product of the average of 288 million barrels annually.

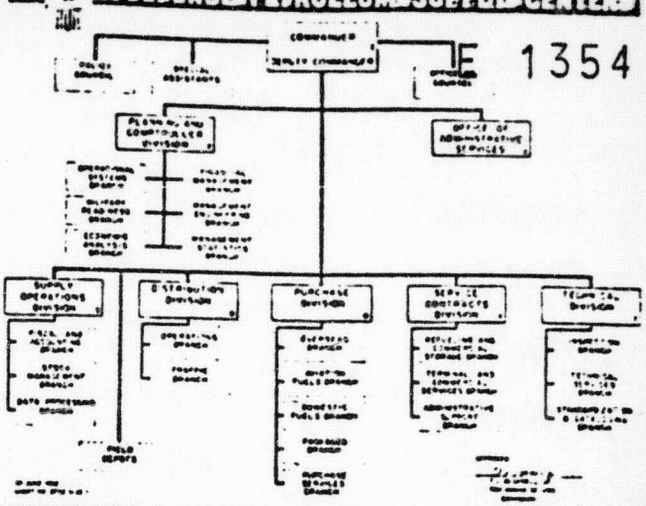
(9) Chart on JPO Organization

As mentioned earlier, our scope of operations, unlike other Commodity Centers, carries us beyond the tidewaters of the United States. In carrying out these responsibilities, unique to the commodity of petroleum, we have petroleum organizations overseas to assist us. These organizations are called Joint Petroleum Offices, and were established by the Joint Chiefs of Staff because of the vital importance of insuring POL logistical support to the Unified Commanders. The officers on the Staff of each Unified Commander provide logistical support planning, and direct operations pertaining to petroleum for support of the theater mission. The Offices are jointly staffed by members of the four Military Services. They act as the ordering Agency in placing demands on DPSC for petroleum products developed by the Component Commanders and consolidated by the Unified Commander to meet the operating and war reserves required for support of Military Forces in the overseas areas.

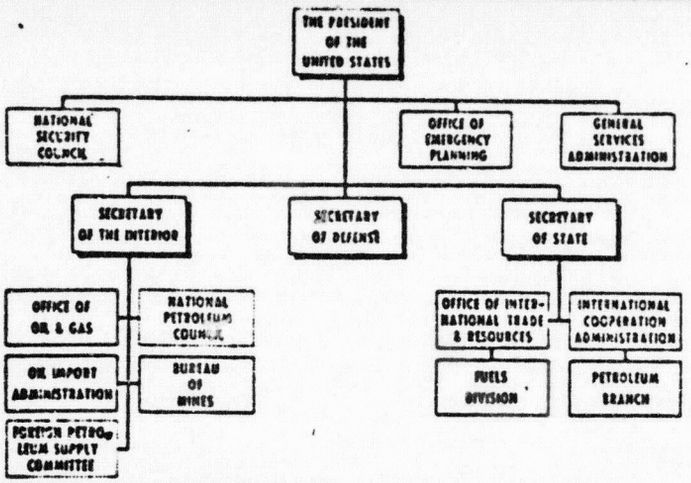
In summary, the petroleum supply chain from initial determination of requirements to final delivery into ships, aircraft, tanks and trucks around the globe contains many organizational links. The strength of this petroleum supply chain has been crises tested. Its toughness and flexibility are attributable to the United efforts of the men and women in the Government organizations and the petroleum industry.

E 1354

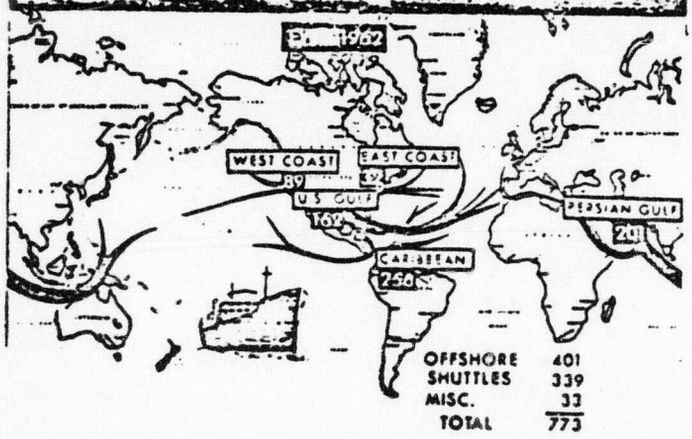
DEFENSE PETROLEUM SUPPLY CENTERS



[illegible] PETROLEUM [illegible]

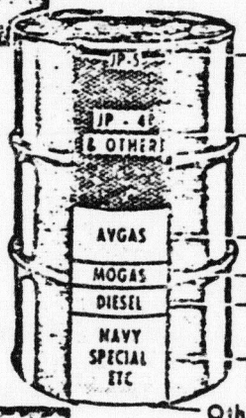


MILITARY TANKER [illegible]



OFFSHORE	401
SHUTTLES	339
MISC.	33
TOTAL	773

PETROLEUM PROCUREMENT IN BARRELS

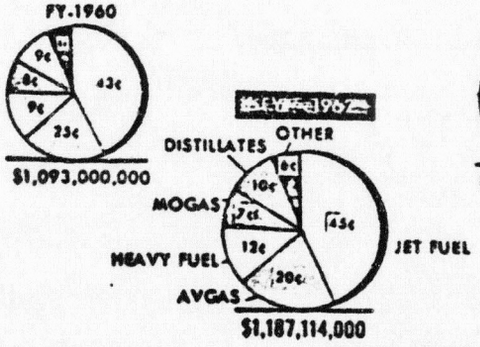


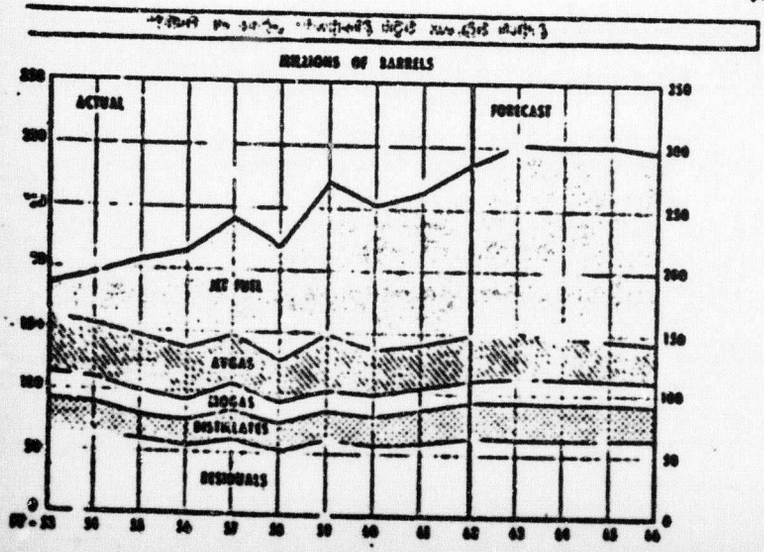
	FY 1962	FY [illegible]
JP-5	3%	3%
JP-4 & OTHER	43%	42%
AVGAS	13%	13%
MOGAS	6%	7%
DIESEL	10%	10%
NAVY SPECIAL ETC	24%	24%
Other	1%	1%

FISCAL YEAR 1962
317,816,000 BBLS

FISCAL YEAR 1961
279,871,000 BBLS

[illegible] PETROLEUM [illegible]





THE JOINT PETROLEUM OFFICE



PROCUREMENT OF PRODUCTS

by

E 1355

Captain O. W. Stafford, SC, USN

Our basic tool for supplying petroleum product to the Armed Forces is what we call an open-end contract. Simply stated an open-end contract is a document which permits the using activities within the Services to order directly from the contractors what they need when they need it. The Military Services give DPSC the estimated quantities and using locations and these in turn form the basis for awarding the open-end contracts.

For purposes of discussion, our procurement effort is divided into two parts: Domestic and Overseas. First, we will discuss domestic procurement.

Insofar as practicable, we take advantage of the vast commercial distribution system for petroleum product that exists in the United States. One of the documents we use for this purpose is called a post-camp-and-station contract. This contract permits the using activity, large or small, to order its motor gasoline, diesel oil, kerosene, and heating oil from a local source of supply as the need arises. A similar arrangement is in effect for supplying lubricating oils and greases.

We are obliged to use a different system of supply for our ships and planes. Although some features of the post-camp-and-station arrangement are retained, the supplying of ships and planes is largely accomplished through centralized ordering within the Services for delivery to government-owned or government-controlled terminals.

Navy Special, as many of you know, is the fuel oil for our ships. It is a specification product made especially for us. At the seaports where we have no facilities for refueling ships, we contract for Navy Special delivered into our vessels. However, the bulk of Navy Special is bought for government-owned coastal terminals. We have an annual import quota of about one and one-quarter million barrels of black product and we apply Navy Special against this quota.

Turning now to aviation requirements we have three principal aviation fuels: JP-4 jet fuel used almost exclusively by the Air Force; JP-5 used by the Navy, and 115/145 aviation gasoline used by all the Services. To give you some conception of the procurement and distribution pattern I have selected JP-4 for comment. Any one of the three fuels would serve but JP-4 has more of an appeal because of the volume and because of the industry-wide interest in this product.

We buy JP-4 for domestic use twice a year by means of advertised procurement. The volume is tremendous by any standards: the last two procurements have each been for about 55 million barrels of product. In these days of millions and billions we tend to lose our perspective. In terms of tank cars, our semi-annual procurement of 55 million barrels of JP-4 would form a train reaching from Washington D.C. to Chicago.

The requirements pattern for JP-4 calls for delivery to ocean terminals, barge terminals, pipeline terminals and for other large volume locations as well as to the smaller installations. The Services submit requisitions in June and

December of each year and DPSC makes contracts for six months periods, April through September and October through March. We have an annual import quota of clean product of about 12 million barrels and we apply JP-4 against this quota.

Now let us look at our overseas procurement. In other presentations you have been told that our annual volume of procurement is in excess of one billion dollars. About three hundred million of this is for overseas procurement. Overseas procurement is defined as procurement from an overseas source of supply; however, it should be emphasized that the majority of these procurements are from American firms doing business abroad.

The source of supply for our forces overseas are the Caribbean, the Near East, local sources within the foreign countries themselves and in the case of aviation gasoline the United States.

Let us consider the various areas of the world requiring petroleum support. First, the European Area comprising the United Kingdom, France, Germany and Spain. In Great Britain there is a British-owned pipeline extending throughout the country where most of our bases are located and product is delivered through this line. Contract coverage has been arranged for those bases that cannot be served by the pipeline.

Our forces in France and Germany are supplied by a U.S. operated pipeline extending from Donges, near Saint Nazaire on the Atlantic Coast of France, to Germany. As in Great Britain, those locations that cannot be supported by the pipeline are serviced by other means.

The United States Forces in Spain also receive their product by U.S. operated pipeline. The terminal for this line is at Rota near Cadiz on the Atlantic Coast of Spain.

In the Mediterranean Area we have forces in the interior of Italy, Greece and Turkey and the SIXTH fleet is based at Naples. The bases are supplied by local delivery within those countries and to a limited extent from refineries in the Near East. A long-term contract for Navy Special and JP-5 with an American refiner in Italy meets the needs of the U.S. SIXTH Fleet in the Mediterranean.

Turning now to the Far Pacific, our forces in that area of the world are supplied from refineries in the Near East. The requirements for our Army in Korea for the SEVENTH Fleet in Formosa Straits and for the U.S. Air Force in the Far Pacific are satisfied largely through deliveries of product to storage locations in Japan, the Philippines, Okinawa, Guam, etc.

We have covered most of the areas of the world except our military installations North of the U.S. border. Those located in the interior of Canada are serviced principally by Canadian firms on a post-camp-and-station basis. Requirements for Labrador, Newfoundland, Greenland and Iceland come almost entirely from the Caribbean.

There are two additional types of contract coverage quite essential to our needs that I have not mentioned. One of these is the into-plane contract. This is merely another name for refueling service at commercial airports throughout

the world for U.S. government planes, either civilian or military. These contracts will be found in far away places such as Addis Ababa in Ethopia or Christchurch in New Zealand. We also have what we call world-wide bunkering contracts. These are the surface ship counterparts of the into-plane contracts. Everywhere that U.S. Navy ships or MSTS ships are likely to go we have anticipated their fuel requirements with a contract which enables them to be refueled and serviced.

This in brief is how DPSC furnishes petroleum support to the U.S. Armed Forces.

CHAPTER V

BEST COPY AVAILABLE

CHAPTER V

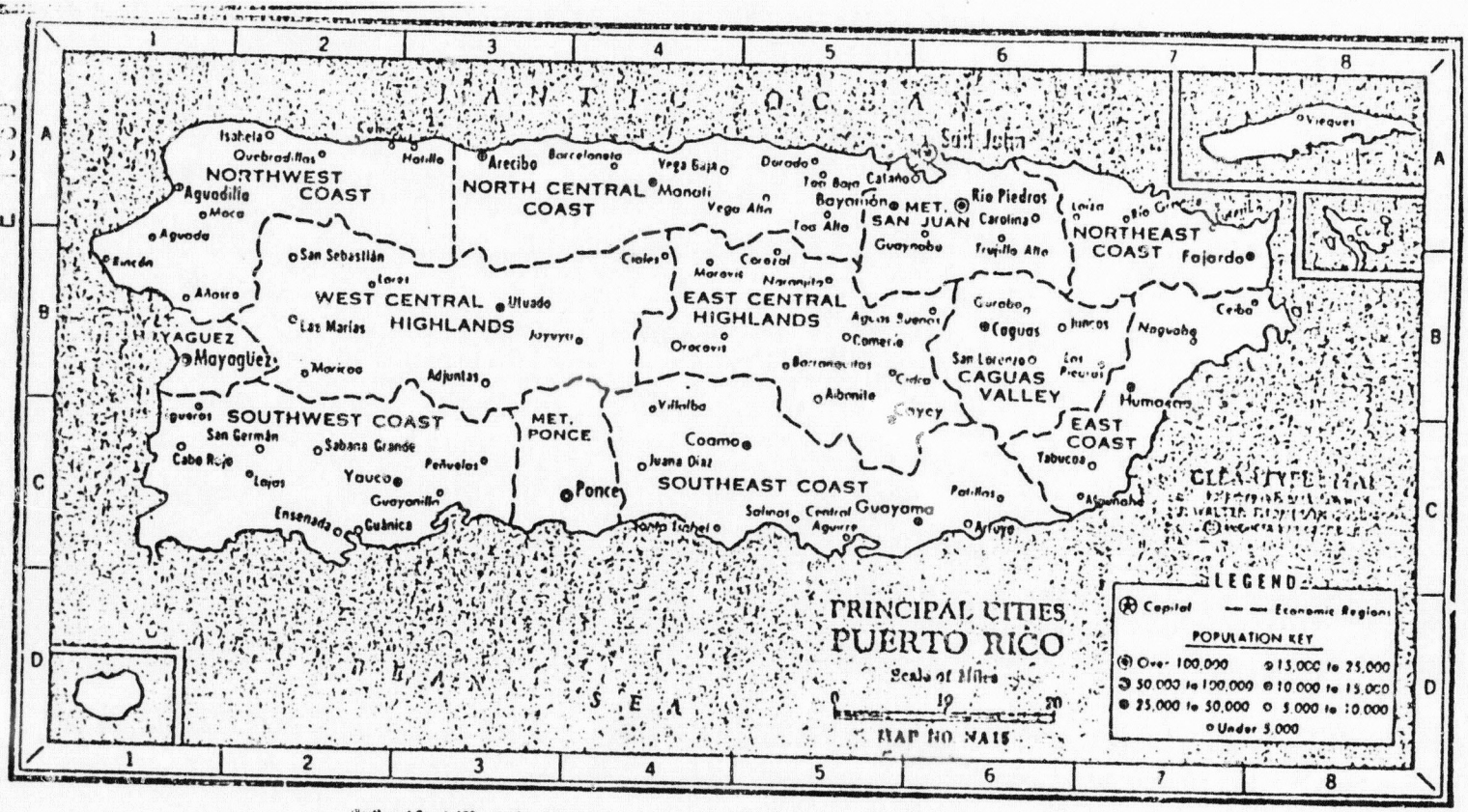
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ENGINEERING PLANNING

Engineering planning has been directed toward a practical compromise between a standard refinery and refinery designed to produce a maximum of petrochemical products for which there is little or no present market. The compromise results in a core plant to produce petrochemical feed stocks at the maximum rate they can be marketed. Further, however, is the key that this plant must be designed so that additional petrochemicals can be withdrawn in the future and that the company is committed to providing these additional petrochemicals or feed stocks.

Two studies and an addendum to the second study have been made by the Universal Oil Products Company for the proposed core plant. The plant covered by the second study with addendum produces approximately 18% of the dollar sales volume in petrochemicals. By adding a sulfur recovery unit and a tetraethyl lead antiknock additive plant, the petrochemical sales will increase to approximately 20%.

The study covers a 60,000 bbl/day refinery designed to produce a maximum practical quantity of petrochemical raw materials and intermediates. It includes capital and operating cost estimates, manpower requirements, process description, yields, estimated net operating income, and a site survey.



ECONOMIC REGIONS

(14 Regions)

Name of region followed by population in thousands, to nearest thousand, then location on map.

Caguas Valley, 144. B- 6
East Central Highlands, 206 B- 4
East Coast, 106 C- 7
Met. Mayaguez, 87 B- 1
Met. Ponce, 127. C- 3
Met. San Juan, 509. A- 5
North Central Coast, 213 A- 3
Northwest Coast, 198. A- 2
Southeast Coast, 171. C- 4
Southwest Coast, 180 C- 2
West Central Highlands, 187. B- 3
Vieques Island, 9. A- 8
Culebra Island, 1 A- 8

Total PUERTO RICO 2,229.

CITIES

Name of city followed by population in thousands, to nearest thousand, then location on map.

Adjuntas, 5. B- 3
Aguada, 3. B- 1
Aguadilla, 18 A- 1
Aibonito, 5 B- 5
Añasco 3. B- 1
Arecibo, 29 A- 3
Arroyo, 5 C- 6
Barceloneta, 1. A- 4
Barranquitas, 4. B- 5
Bayamón, 20. A- 5
Cabo Rojo, 5 C- 1
Caguas, 34. B- 6
Camuy, 2 A- 2
Carolina, 5. A- 6
Cataño, 9 A- 6
Cayey, 18 C- 5
Ceiba, 1. B- 8
Central Aguirre, 3. C- 5
Ciales, 3 B- 4
Cidra, 3. B- 5
Coamo, 12. C- 4
Comerío, 5. B- 5
Culebra, 1. B- 8
Dorado, 3 B- 1
Ensenada, 5. A- 3
Fajardo, 15 C- 6
Guánica, 5. A- 1
Guayama, 19 B- 6
Guayanilla, 3. C- 1
Guaynabo, 2. A- 6
Gurabo, 4 B- 6
Hatillo, 2 A- 2
Hormigueros, 3. A- 1
Humacao, 11 B- 7
Isabela, 7 A- 3
Jayuya, 2. B- 3
Juana Díaz, 5. C- 5
Juncos, 8 B- 6
Lajas, 1 C- 1
Las Marías, 5 A- 1
Loíza, 3 A- 8
Luquillo, 2 A- 5
Manatí, 10. A- 4
Maricao, 1. B- 1
Maunabo, 1 C- 7
Mayagüez, 59. A- 1
Moca, 1 A- 2
Morovis, 2 B- 4
Naguabo, 4. B- 7
Naranjito 2. B- 5
Orocovis, 3 B- 4
Patillas, 2 C- 6
Peñuelas, 2 C- 3
Ponce, 99 C- 4
Quebradillas, 2 A- 2
Rincón, 1 A- 1
Río Grande, 3 A- 7
Río Piedras, 132. A- 6
Sabana Grande 6 C- 2
San Germán, 9. C- 2
San Juan 295 A- 6
San Lorenzo, 7. B- 6
San Sebastián, 5. B- 2
Santa Isabel, 4 C- 4
Toa Alta 1 A- 5
Toa Baja 1 A- 5
Trujillo Alto, 1. A- 6
Utuado, 10 B- 3
Vega Alta, 3. A- 5
Vega Baja, 9. A- 4
Vieques, 3 A- 8
Villalba, 1 B- 4
Yabucoa 5 C- 7
Yauco, 10 C- 3

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The details of the U.O.P. studies are included in Appendix B.

The general area of the site is shown in red on the map opposite. Further details of their site are shown on pages 45-47 of Appendix C.

# # #

CHAPTER VI

E 1362

ECONOMIC DATA AND FINANCING PLAN

The financial advisors to the PUERTO RICO OIL AND PETROCHEMICAL CO. have developed the following plan for financing the core plant.

This plan is an extension of the cost estimates from the study carried out by the UNIVERSAL OIL PRODUCTS CO., and includes additional financing for operating capital, including overhead and sales expenses, and contingencies to cover start-up expenses and unforseen delays in reaching a profitable rate of production. This contingency fund is approximately 20% more than the estimated costs shown in the UNIVERSAL OIL PRODUCTS study attached hereto, entitled PROCESSING AND ECONOMIC DATA FOR A PROPOSED PUERTO RICO REFINERY+SECTION 3+SUMMARY.

As shown in TABLE I, the total capital investment is estimated at $68,485,590 of which 80% is to be provided through Sinking Fund Debentures and 20% is to be provided through equity capital. In addition, the plant site is to be provided by the Commonwealth, and leased to the company. The area development is to be carried out by the Commonwealth.

To the estimated sum of $68,485,590, the company has added a sum of approximately 15% for operating capital, and unforseen expenses, bringing the total to $79,000,000.

The calculation in TABLE I of Net Operating Cost and Income is a proforma presentation, and flexibility exists under the tax laws of the Commonwealth to permit full depreciation before any taxes are due. Other more favorable handling of debt burden could be anticipated as the situation requires. However, the plan as shown is feasible, and should suffice.

The UNIVERSAL OIL PRODUCTS financial study is fully adequate in the opinion of the financial advisors to the company.

Stability is added to this plan by virtue of the marketing contract between the company and PHILLIPS PETROLEUM COMPANY, which assures the sales of the available product from the core plant.

This financial plan will be implemented through an S.E.C. Prospectus as soon as an oil import permit is issued to the company. The body of this Report, together with the financial plan, is substantially the material which will constitute the S.E.C. Prospectus.

Following is the report by the UNIVERSAL OIL PRODUCTS CO.

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE I

ESTIMATED NET OPERATING INCOME

ear	Product Value	Charge Value	Gross Profit	Operating Expenses	Net Profit	Sinking Fund Debent.	Debent. Interest 5	Income Before Depreci.	Depreci.	Balance Before Taxes	Income Taxes	Income After Taxes	Earnings on Equity (a) Net	Earnings on Equity (a) Gross
1	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	3,287.3	12,797.6	3,131.7	9,665.9	-	9,665.9	6,926.5	10,058.2
2	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	3,122.9	12,562.0	3,131.7	9,830.3	-	9,830.3	7,040.9	10,222.6
3	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	2,958.6	12,126.3	3,131.7	9,994.6	-	9,994.6	7,255.2	10,386.9
4	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	2,794.2	12,290.7	3,131.7	10,159.0	-	10,159.0	7,419.6	10,551.3
5	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	2,629.8	12,455.1	3,131.7	10,323.4	-	10,323.4	7,584.0	10,715.7
6	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	2,465.5	12,619.4	3,131.7	10,487.7	-	10,487.7	7,748.3	10,880.0
7	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	2,301.1	12,783.8	3,131.7	10,652.1	-	10,652.1	7,912.7	11,044.4
8	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	2,136.8	12,948.1	3,131.7	10,816.4	-	10,816.4	8,077.0	11,208.7
9	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	1,972.4	13,112.5	3,131.7	10,980.8	-	10,980.8	8,241.4	11,373.1
10	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	1,808.0	13,276.9	3,131.7	11,145.2	-	11,145.2	8,405.8	11,537.5
11	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	1,643.7	13,441.2	3,057.0	11,384.2	4,170.6	7,213.6	4,474.2	7,331.2
12	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	1,479.3	13,605.6	3,057.0	11,548.6	4,231.0	7,317.6	4,537.6	7,495.2
13	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	1,314.9	13,770.0	3,057.0	11,713.0	4,291.4	7,421.6	4,601.2	7,659.2
14	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	1,150.6	13,934.3	3,057.0	11,877.3	4,351.8	7,525.5	4,666.1	7,823.1
15	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	986.2	15,098.7	3,057.0	12,041.7	4,412.2	7,629.5	4,730.1	7,987.1
16	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	821.8	15,263.1	927.0	14,336.1	5,255.4	9,080.7	6,341.3	7,268.3
17	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	657.5	15,427.4	927.0	14,500.4	5,315.8	9,184.6	6,645.2	7,372.2
18	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	493.1	15,591.8	927.0	14,664.8	5,376.2	9,288.6	6,569.2	7,476.2
19	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	328.7	15,756.2	927.0	14,829.2	5,436.5	9,392.6	6,653.2	7,580.2
20	77,923.4	48,645.0	29,278.4	13,193.5	16,084.9	2,739.4	164.4	15,920.5	927.0	14,993.5	5,497.0	9,496.5	6,759.1	7,685.1

Notes:

(a) Total capital investment $68,485,590
30% Equity Capital $13,697,118
70% Convertible Sinking Fund Debentures, 6% interest, 20 years $54,788,472

(b) Yearly sinking fund, 1/20 of $54,788,472 = $2,739,424 paid at the end of each year out of income after taxes.

(c) Debenture interest, 6% on the unpaid debentures.

(d) Earnings on equity: Net income after payment of the yearly sinking fund.
Gross income after payment of the yearly sinking fund plus depreciation.

(e) Depreciable items: Process and offsites facilities and startup capital.

(f) Depreciation rate: Process Capital-straight line on 15 years life 10% salvage value.
Offsite Capital-straight line on 20 years life 10% salvage value.

(g) Income Tax: No income tax due for 1st ten years. Thereafter, tax rate is 35.75% of taxable net income less $10,100.

(h) All numbers in thousands.

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LONG TERM DEBT AND CAPITAL STOCK E 1363

PUERTO RICO OIL AND PETROCHEMICAL

COMPANY

LONG TERM DEBT:

6% Sinking Fund Debentures* due December 31, 1977	... $34,000,000
6% Sinking Fund Debentures* due December 31, 1982	... $34,000,000

*With Warrents Attached

COMMON STOCK:

Public Offering @ $1.00*	... $11,000,000
	$79,000,000

*Authorized and Issued: 15,000,000 shares of which 11,000,000 constitutes the Public Offering, first in Puerto Rico, for 60 days, and then open to outside areas. The balance of 4,000,000 shares to management.

In setting forth this plan for financing, the continuation of current market conditions is assumed. In addition, a contingency fund of 20% has been provided for the unforseen.

The Commonwealth will provide the plant site and all area facilities which will be used jointly with others. The company will provide those facilities which it will use exclusively, including the off-shore tanker berths. The Commonwealth will lease the plant site to the company.

# # #

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NATIONAL INSERTABLE-TAB INDEXES ENABLE YOU TO MAKE YOUR OWN SUBJECT ARRANGEMENT, USING PLAIN INSERTS ON WHICH TO WRITE YOUR OWN CAPTIONS.

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APPENDIX A

E 1368

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

INTRODUCTION

The primary purpose of this study is to act as an aid in the investigation of the general economics and technology of a proposed 60,000 barrels per day (BPD) refinery processing a typical Venezuelan crude to produce normal petroleum fuels as well as the maximum feasible quantity of petrochemical raw materials and intermediates.

Included in this report are tables showing the operating cost and expenses, profitabilities and yield estimates of the various process units utilized in the original scheme and addendum thereto. Also, a general description of the processes with their flow diagrams are present.

The attached process and economic study is largely based on information developed and processed by Universal in regards to Puerto Rico. However, while the study has been prepared by us in accordance with established engineering practice and is useful in evaluating the proposed refinery and operations, it does not constitute any warranty, representation or guarantee with respect thereto. It is understood that Universal Oil Products Company's name shall not be used in connection with any prospectus or securities registration statement to be filed by your company with any governmental agency.

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Product Price	$/Bbl.	¢/Gal.
Premium Gasoline	4.979	11.86
Regular Gasoline	4.628	11.02
No. 1 Fuel Oil	3.896	9.28
No. 2 Fuel Oil	3.430	8.17
No. 6 Fuel Oil	2.151	5.12
Pitch	1.800	4.29
L.P.G. (C_3)	2.964	7.06
Mixed C_3's	2.964	7.06
Mixed C_4's	2.964	7.06
Benzene	10.500	25.00
Toluene	7.560	18.00
C_8 Aromatics	6.300	15.00
Raffinate	4.041	9.62
Naphthalene, ¢/#	--	(5.0)

Operating Costs

In constructing the operating costs for a Puerto Rican refinery various costs such as labor, utilities, fringe benefits, operating personnel requirements as affected by local labor efficiency, and other associated costs were taken into general consideration based on knowledge from current similar operations present in Puerto Rico.

Estimated Process and Offsites Investment

The estimated capital investment for process and offsites facilities of the proposed schemes are based on curve estimates of current day costs of similar equipment erected at a U.S. Gulf Coast location. These cost estimates are subject to precise design definition; however, they are sufficiently accurate for planning purposes. There may be some question arise as to the differences that construction costs would be lower in Puerto Rico than the United States Gulf Coast. It is believed that all major items of equipment will be shipped in from the U.S. which will increase material costs somewhat over Gulf Coast prices. Labor prices are lower in Puerto Rico but considering the available pool of skilled labor in Puerto Rico to construct a 60,000 BSD refinery is quite small. A construction firm would need to import continentals to supply the skill job classifications. This labor cost as well as somewhat higher material costs should just about equalize capital investment in Puerto Rico to that at the U.S. Gulf Coast location.

E 1370

Yield Estimates

The exactness of the yield estimates shown throughout are adequate for the purposes of this report, but will require confirmation for precise process designs. Depending on the final settlement of the type of crude to process and type of products to be produced will determine the process scheme as well as more precise yield.

In order to provide the highest reasonable degree of accuracy in the estimates made through this report, the respective product distribution and erected cost are based upon processes licensed by Universal Oil Products Company. Specific processes of the same general type will experience somewhat different product distribution and erected cost. Because of our greater familiarity with the specific capability and cost factors of these processes as compared with competing processes, the estimates shown in this report are based on processes as follows:

Specific UOP Process Used as Basis for Evaluation
Fluid Catalytic Cracking Process Unit (F.C.C.)
UOP Catalytic Condensation Process Unit
UOP 'HF' Alkylation Process Unit
UOP Platforming Process Unit
Unifining Process Unit
Udex Process Unit
Hydeal Process Unit
UOP Merox Process Unit

Other non-licensed processes and offsite facilities are the type that Universal has had many years of commercial experience in the design and economic evaluation.

E 1371

Site Investigation Trip to San Juan

On February 20, 1962, a preliminary site survey was conducted in Puerto Rico.

The following are comments and general findings on the various locations viewed from the aerial and motor trip:

The north and east coasts of the island were ruled out due to lack of suitable unoccupied port sites. San Juan is already the site of one petroleum refinery and Roosevelt Roads is a U.S. Naval & Missile Base. Furthermore, the prevailing winds are northeasterly.

Five port sites were selected for consideration on the east, south and west coasts of the island, namely, Puerto Yabucoa, Bahia de Jobos (Central Aguirre), Bahia de Guayanilla, Bahia de Guanica and Bahia de Añasco. Each of these prospective sites will be discussed in detail.

Puerto Yabucoa

Playa de Guayanes is a small town serving as a port for Yabucoa located five miles inland. Yabucoa has a population of 5,300 with general stores, two small hotels, a hospital and telephone and telegraph facilities. San Juan is located 50 miles northwest by highway. The sugar industry furnishes business for the town and port. Only vessels of 14-foot draft or less can enter the harbor and the passage is difficult. Vessels navigate in and out of the harbor during daylight hours only. Strong northeasterly afternoon breezes make two anchors on a vessel necessary. Deep water is 1700 yards off shore and unprotected from the weather. The bay is two miles wide with numerous reefs and sunken rocks. An extended area of level, firm ground runs back from the bay to Yabucoa.

Bahia de Jobos

The harbor of Bahia de Jobos consists of an anchorage 5 miles long and varying in width from 1/2 mile to 1 mile. However, only 50% of this area is of a depth of 23 feet or greater. The bottom is soft and ships' anchors would drag during a hurricane. The land surrounding this harbor is low-lying and swampy. However, farther inland there are extended areas of level, firm ground.

The town of Central Aguirre located on Bahia de Jobos has a population of 3,000 with telephone and telegraph services. The sugar industry has a pier here 1,300 feet long. Vessels drawing up to 23 feet can berth on either side of it.

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Bahia de Guayanilla

Bahia de Guayanilla, located 7-1/2 miles west of Ponce, is the largest hurricane harbor, and one of the best in Puerto Rico. It can accommodate vessels of 40 feet draft or less. Commonwealth Oil Refining Company and Texas Company have wharves in this bay.

The town of Guayanilla with a population of 2,000 to 3,000 is located two miles inland and has no urban facilities. The limited amount of level ground between the bay and the town is rather low-lying for refinery construction. Punta Verraco, a point of land 1/2 mile wide and 1-1/2 miles long extending eastward outside the bay has no level land areas suitable for a refinery site without considerably land-leveling or benching and in time the area might prove to be rather cramped. Furthermore, a state forest is located just west of the bay and as a recreational resort might cause public relations problems for a petroleum refinery at some future date. The city of Ponce is located 12 miles to the east.

Bahia de Guanica

Bahia de Guanica is a good, natural harbor but too small and shallow for the berthing of oil tankers. Two small towns are located on the bay, Ensenada and Guanica. Each has a population of about 4,000 to 5,000. Telephone and telegraph services are available at both towns.

Bahia de Añasco

Bahia de Añasco is on the west coast of the island facing Mona Passage. Deep water runs in close to shore. In one area the water is 48 feet deep within 300 yards of the shore line. (This 48 feet depth area should be checked by sounding to confirm the hydrographic map.). On shore, extended areas of firm, level ground are available for choosing a refinery site, also electrical transmission lines run through this area. Judging from the lay of land sufficient fresh water should be available from water wells. However, in case additional water should be necessary, water reservoirs could be constructed without great difficulty in the hilly country just north of Bahia de Anasco.

The town of Anasco with a population of 3,500 is located 4 miles to the east of the bay and the city of Mayaguez with a population of 50,000 to 60,000 is located 12 miles to the south of the bay. Mayaguez has a shipping terminal that can accommodate vessels of 30 feet draft. This shipping terminal has a wharf 1200 feet long equipped with a shed 800 feet long by 60 feet wide plus various pieces of modern equipment for the mechanical handling of cargo.

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Mayaguez has a number of stores and shops, two good hotels, telephone and telegraph service, an airport serviced by scheduled airline flights, plus a branch of the University of Puerto Rico. San Juan is 118 miles away by coastal highway. On Punta Higuero, 10 miles north of the bay, is a nuclear reactor in the construction stage.

After deliberating over the advantages and disadvantages of the five above-mentioned possible sites for a petroleum refinery, we believe that the Anasco Bay area should be chosen for the following reasons:

(1) A large area of firm, level land from which to choose a refinery site without pre-empting established settled areas.

(2) A bay which can be without difficulty fitted out with oil tanker berthing facilities.

(3) Likelihood of a good supply of fresh water.

(4) A petroleum refinery located here would be close to two centers of population - the town of Anasco and the city of Mayaguez. With these two centers of population nearby a ready-made labor market is at hand - already housed.

(5) The fact that there is a branch of the University of Puerto Rico in Mayaguez might be of interest to permanent refinery employees.

(6) Mayaguez has a suitable port for unloading construction material and refinery equipment with only a short haul to the refinery site.

(7) A petroleum refinery located on Bahia de Anasco would be in a favorable position to fuel ships sailing the Mona Passage.

(8) The area around Mayaguez and Bahia de Anasco has been by-passed by the rising tide of Puerto Rico economic development which is so evident at San Juan and Ponce.

(9) This area is serviced by a regularly scheduled airline as well as chartered flights.

(10) The area has a modern highway traversing it, backed up by a substantial secondary road system.

(11) Electrical power transmission lines run through this area with the power generating stations not too far away.

The only disadvantages that a petroleum refinery located near Bahia de Anasco would have is the fact that oil tankers serving the refinery would not have the protection of a suitable harbor like Bahia de Guayanilla.

A petroleum refinery located on Bahia de Guayanilla would have many of the same advantages listed for Bahia de Anasco, namely:

(1) It would be located close to a large center of population - the city of Ponce with a population of 100,000 to 110,000.

(2) Ponce has good port facilities.

(3) The area is served by a regularly scheduled airline as well as chartered flights.

(4) The area has a modern highway system.

(5) Electrical power generating stations are in the area.

(6) The Bahia de Guayanilla is an excellent harbor.

The disadvantages of locating a petroleum refinery in the Bahia de Guayanilla would be two:

(1) The smaller area of firm, level ground from which to choose a refinery site.

(2) The question of a good supply of fresh water must be investigated.

After reviewing the advantages and disadvantages of these two areas - Bahia de Anasco and Bahia de Guayanilla - it is apparent that the choice of a site hinges on whether oil tanker berthing facilities at Bahia de Anasco would cost a great deal more than similar facilities at Bahia de Guayanilla and, also, whether the Commonwealth of Puerto Rico wishes a further concentration of industry around Ponce or give the economy in the area around Bahia de Anasco and the city of Mayaguez a lift.

E 1375

On Stream Time

345 stream days per year have been used giving a 95% on stream efficiency. For example, 60,000 barrels per stream day (BSD) of crude charge to the crude unit is 57,000 barrels per calendar day (BCD). The other 20 days left in the year are for process maintenance.

Utilities

Electricity - Assume purchase of power from Puerto Rico Water Resources Authority.

Refinery Fuel - Refinery fuel gases produced from the various processing units with the supplement requirements made up by using visbreaker pitch. Gaseous fuel deficiency would be made up by the pitch, which would be used preferably in the atmospheric and vacuum distillation and visbreaking unit.

Water Supply - A potable water supply for refinery sanitary facilities and steam boiler make-up is assumed to be obtained from fresh water wells. Process cooling water will be sea water.

Steam Generating Facilities - Sufficient refinery steam generating facilities have been provided even in the cases where a process having waste heat-steam generation facilities may be upset.

Inventories - Crude and Products

Since crude and product inventories tie up a large dollar value in a refinery of 60,000 BSD capacity, a strict control and review should set policy on this matter. It is assumed that crude inventory is twenty days for this size refinery. A leasing of super tankers to handle crude delivery should be investigated. A round trip for crude delivery by super tanker is considered about 5-8 days between Venezuela and Puerto Rico.

The majority of the products produced are considered for exporting to the east coast of the United States. A reasonable inventory was taken into account for the products considering time necessary for a round trip and quantity of material available for shipment by T-2 tankers.

A thorough investigation of the pitch and LPG local markets will aid in determining the economics of supplementary refinery fuel gas with either pitch or LPG. Large LPG inventories can be costly from the storage standpoint.

Acquirement of Total Capital Investment

The total capital investment was assumed to be raised by the following means as stipulated by Omega Management Incorporated.

20% of capital investment will be equity capital

80% of capital investment will be convertible sinking funds debentures, 6% interest rate, 20-year term.

In determining the economics of the two cases, it was assumed that the yearly sinking fund payment is 1/20 of the total debentures. Yearly payment is made at the end of the year and from income after taxes. The 6% interest rate on the sinking fund debentures is on the year beginning unpaid balance of debentures.

Equity capital is in the form of common stock.

Income and Property Tax

During the first ten years of the proposed cases no corporate income or property tax is due. The rates used after that are based on the current rates as developed by the Department of the Treasury, Commonwealth of Puerto Rico and listed in "What You Should Know About Taxes in Puerto Rico," 1961 edition.

Depreciation Rates and Items

Depreciation rates and items used in the economics of the two cases are considered normal for a typical refinery. However, there are always extremes from the average for various reasons and is determined by company policy, within government regulations.

Process and offsites facilities and starting capital are considered the depreciable items. Depreciation rate is as follows:

1. Process capital - straight line on 15 years life - 10% salvage value
2. Offsites capital - straight line on 20 years life - 10% salvage value
3. Startup capital - straight line on 10 years life.

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

BASIC CONSIDERATIONS

E-1377

In performing the study certain assumptions were made and are listed in this section under various categories.

Crude Oil Supply and Price

In reviewing the crude oils that are available from Venezuela, several crudes were found to be typical and in sufficient production quantity that could supply the needs of the proposed refinery. For this study, a Venezuelan crude known as Tia Juana Medium crude was used. This crude is believed to be available for long term contracts. A laid-in price at the refinery for this crude was taken at $2.35/bbl.

Product Market and Prices

The quantity of petroleum products produced from a 60,000 BSD refinery located in Puerto Rico were assumed to be, to a great extent, exported out of the country to the east coast markets of the United States. Current output of the two refineries presently in Puerto Rico far outdistances current and future demands of petroleum fuel for local market consumption. A relatively high percentage of the current refinery outputs are exported to the east coast markets. The assumption was also made with petrochemical raw materials and intermediates although joint ventures or future petrochemical expansion would limit the export of petrochemicals so derived.

Therefore, all petroleum fuel products and petrochemical material were assumed to have sufficient export and local markets to absorb all production quantities. It is suggested than an organization contemplating entering in the refining or petrochemical industry should make a close examination to determine their market position as to the type of products and quantities they wish to handle under long term manufacturing contracts.

Product prices used in the study are believed to be those generally applicable to those received at the refinery gates in the Puerto Rico area. They are a combination of local market prices and export market prices.

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

E 1378

PROCESS DESCRIPTION AND YIELDS

INTRODUCTION

Block flow diagram No. 76845-C-O shows the general processing scheme that is utilized in this case. The main considerations were to design a refinery with a maximum of flexibility to produce normal petroleum fuels and a maximum of petrochemicals and petrochemical feedstocks. The flexibility of design is required to provide additional petrochemicals and petrochemical feedstocks in the future.

The process flow is described below:

CRUDE DESALTING

While the crude used for this study does not show an appreciable amount of salt, electrical desalting equipment is provided to enable crudes to be processed, which are less satisfactory in this regard.

ATMOSPHERIC DISTILLATION

In this scheme one 60,000 BSD unit is considered rather than the possibility of two smaller units of 30,000 BSD capacity each.

Preflashing or prefractionation is chosen to give the most economical use of heat. A light straight run stabilizer is provided. The Tia Juana Medium light straight run in particular needs to be stabilized and while the stabilizer could be omitted with the light straight run stabilized in the FCC Gas Recovery unit, this would reduce operating flexibility. Only one grade of gasoline then could be produced.

A light naphtha, 165-270°F., is taken overhead from the atmospheric crude column and is processed in a Unifiner for sulfur removal and is further processed as described later. A heavy naphtha, 270-450°F., is taken as a side stream from the crude column and is processed in a Unifiner for sulfur removal and to further processing as described later. A middle distillate (450-650°) is taken as a side stream from the crude tower, processed in a Unifiner for sulfur reduction and sent to storage as a finished product. The reduced crude from the bottoms of the crude tower is sent to vacuum unit.

VACUUM DISTILLATION

The function of this unit is to prepare vacuum gas oil as charge to the FCC unit. It should be designed carefully to keep entrainment of asphalt from the gas oil to a minimum and thus at the same time keep the metal contaminants, harmful to the FCC operation, at a minimum in the FCC feed. The vacuum pitch obtained from the bottom of the vacuum unit is sent to the visbreaking unit.

VISBREAKING UNIT

Visbreaking is particularly advantageous in a dual process function. It prepares distillate stocks and at the same time reduces the viscosity of residual bottoms so that less cutback material is required to meet No. 6 fuel oil specification. Light materials from this operation are sent to FCC Gas Recovery system for recovery of the C_3's and C_4's. The visbreaker gasoline is split into two fractions, a C_5-270°F. and a 270-400°F. material. Each fraction is joined with the respective virgin naphtha fraction, processed in a Unifiner for sulfur reduction and olefin saturation, and then to further processing as described later. The vacuum pitch is sold with cycle stock (FCC cycle oils) as No. 6 fuel oil or burned as a fuel within the refinery or by other industrial consumers close to the refinery.

FLUID CATALYTIC CRACKING AND GAS RECOVERY UNITS

This system of Catalytic Cracking has been chosen as it has been most widely accepted in the industry and is the most representative. The function of this unit is to convert heavy distillate oils into high octane gasoline and to reduce the overall refinery fuel oil production. Current designs are noted for simplicity, ease of operation and low operating and investment costs. The process also gives good yields of mixed C_3 and C_4 saturate and olefin compounds which can be used for alkylation, catalytic condensation or for petrochemical intermediates.

Charge stock for the FCC has been prepared by the vacuum unit. A conversion level of 70% has been used in this scheme for maximizing light olefin production. However, as mentioned in the introduction, if the pitch sales are not large, conversion level could be reduced for sufficient cycle oils to be produced for blending into No. 6 fuel oil.

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FLUID CATALYTIC CRACKING
AND GAS RECOVERY UNITS (Cont'd)

The gas recovery section (gas concentration) may receive, in addition to the light products from the FCC unit, light products from other refinery sources as straight run stabilizer overhead, Platforming debutanizer overhead and the visbreaking light material. The gas recovery section produces fuel gas, mixed C_3's and C_4's and a debutanized gasoline which is routed to the gasoline pool as a blending component.

LIGHT AND HEAVY NAPHTHA UNIFINING UNITS

An uncomplicated, easily operated process for eliminating sulfur, nitrogen and metallic impurities from petroleum distillates, Unifining provides a simple and economical answer to an operating problem that is frequently difficult and costly to solve by other methods. Also Unifining will simultaneously saturate any olefin present in the feedstocks. It clearly removes impurities and prepares feedstocks of ideal properties for further processing.

Unifining works particularly well in combination with Platforming. It is ideal for pretreating Platformer feedstocks and the excess hydrogen from the Platformer is an excellent, low cost hydrogen source for the unit.

The feed to each of the naphtha Unifiners is comprised of the respective boiling range virgin naphthas from the crude unit and the visbreaker gasolines. Sulfur reduction and olefin saturation occurs during this operation. Hydrogen required for these steps is received from the Platforming unit. H_2S and light materials produced during Unifining are stripped in the Unifiner stripper. The stripper bottoms then become charge to the Platforming unit.

B-T-X PLATFORMING AND
HEAVY NAPHTHA PLATFORMING UNITS

This is one of the most widely used processes in the refining industry. In operation on a broad scale it has proved to be practical and an economical process for upgrading low octane gasolines.

Platformer feedstock is received from the Unifiner stripper. Processing conditions are selected so that a 90 F-1 clear C_5+ Platformate is obtained from the Platformer debutanizer and is routed to the gasoline pool as a high octane

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B-T-X PLATFORMING AND
HEAVY NAPHTHA PLATFORMING UNITS (Cont'd)

blending component. The debutanizer overhead material is sent to the FCC recovery unit for recovery of propane, iso and normal butanes present in the streams. The net separator gas becomes a source of low cost hydrogen for the Unifining operation.

Under proper operating conditions, Platforming fits well into the growing demand for petrochemicals as it is highly efficient for producing a material that contains aromatics such as benzene, toluene and xylenes and these can be readily extracted from the Platformate. As in this scheme, a Unifined naphtha in the boiling range of 165-270°F. is the feedstock for B-T-X Platforming operations. A depentanized Platformate is obtained and this becomes feedstock to a Udex unit as described later. A C_5's and C_4's fraction is recovered and sent to the gasoline pool as a blending component. The depropanizer overhead material is sent to the FCC gas recovery unit for recovery of propane. The net separator gas becomes a source of low cost hydrogen for the Unifining operation.

Within a recent period, under proper operating conditions, it has been found that the Platforming process may produce a material from which naphthalene could be derived. As in this scheme, a Unifined naphtha in the boiling range of 270-450°F. is the feedstock for heavy naphtha Platforming operations. A total depropanized Platformate is obtained which is rerun into a C_4-390°F. and a 390-E.P.°F. fraction. The C_4-390°F. fraction is routed to the gasoline pool as a blending component. The 390°-E.P. fraction becomes a feedstock for further processing as described later for naphthalene production. The depropanizer overhead material is sent to the FCC gas recovery unit for recovery of propane. The net separator gas becomes a source of low cost hydrogen for the naphthalene operation.

DISTILLATE UNIFINING

This proposed method of distillate treating, where hydrogen is available, is based on Universal's considerable experience in the Unifining of distillate oils. Sulfur reduction to meet specifications is the prime function of this operation and the required reduction is readily obtained.

DISTILLATE UNIFINING (Cont'd)

The middle virgin distillate (450-650°F.) as obtained from the crude column combines with a necessary portion of the B-T-X Platformer net separator gas and after heating passes into the Unifiner reactor system. Sulfur reduction in the distillate fraction is the prime purpose of this operation. The product after the Unifiner reactor is stripped and rerun to meet flash point specification to give a product as No. 2 fuel oil.

UDEX EXTRACTION AND B-T-X RECOVERY UNIT

The Udex process is designed to prepare high purity aromatics from catalytic reformate. The Udex process has been proved commercially to be an outstanding method for the preparation of aromatics of purities not previously attained. The aromatic products of the Udex process will not only meet the established ASTM nitration grade specifications but will exceed them. Nitration grade benzene has a minimum solidification point of 4.85°C. The benzene produced commercially from catalytic reformate processed in Udex units has consistently been well above the 5.40 C solidification point. The toluene fraction will have comparable freedom from paraffin impurities. High aromatic product purities are attained which maintains high recovery efficiencies. The benzene recovery efficiency attained in commercial Udex operation has been well above 99%.

The feedstock for the Udex unit in this proposed scheme is the depentanized Platformate obtained from the B-T-X Platforming operation. Through the extraction step, the extract product so obtained has a high purity aromatic content.

However, the extract contains traces of unsaturates, which would limit the purity of the final products and may also contain traces of residual non-hydrocarbon compounds which would spoil the acid-wash color test of the final products. To destroy these trace impurities the extract is processed through Attapulgas or similar clay before final distillation.

UDEX EXTRACTION AND
B-T-X RECOVERY UNIT (Cont'd)

Redistillation of the product is accomplished in three columns in succession making pure benzene and toluene respectively as overhead products, a C_8 aromatic fraction as overhead product and a C_9 plus aromatics product off the bottom of the xylene column.

The isomer distribution in the C_8 aromatic fraction derived from petroleum stocks is approximately:

	Vol.%
ethylbenzene	20
p-xylene	18
m-xylene	42
o-xylene	20

The raffinate obtained from the extraction step is highly paraffinic and needs very little treatment before it is sent to storage. It can be used as a low octane blending component, a jet fuel blending component, or a charge stock for an ethylene cracking process.

HYDEAL

The Hydeal Process is a new process recently announced by Universal. This process is designed for the conversion of alkylbenzenes to benzene or alkylnaphthalenes to naphthalene.

The Hydeal unit proposed for this scheme is designed to convert alkylnaphthalenes to naphthalene. Feedstock is derived from the Heavy Naphtha Platforming operation. The 390-E.P.°F. Platformate fraction usually contains sufficient quantities of alkylnaphthalenes for economical conversion of these compounds into naphthalene. Also present in these feedstocks are some alkylbenzenes that are converted to benzene. The hydrogen source for this reaction is the net separator gas from the Heavy Naphtha Platforming operation.

MEROX

The UOP Merox Process is a fairly new process announced by Universal and is additional evidence of UOP's policy of providing the refining industry with every means for a well-rounded, profitable manufacturing operation. This process provides a low cost operation for treating gasoline and lower boiling fractions for removal of mercaptans, or sweetening heavier stocks by converting mercaptans to disulfides.

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PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

ADDENDUM

ISOMAX CASE

An alternative scheme with respect to the base case considered in our study of April 13, 1962 is presented herewith.

The alternate case included the following changes with respect to the base case:

1. The Fluid Catalytic Cracking Process unit has been replaced by an Isomax Process unit.

2. A hydrogen manufacturing plant has been added to satisfy hydrogen requirements for the Isomax Process unit.

3. The aromatics producing facilities have been increased in size. Additional charge will be gasoline from the Isomax Process unit.

The same general statements and assumptions as presented in the base case apply to this alternate case.

Block flow diagram No. 76845-C shows the general processing scheme of the Isomax Case. The main considerations were to produce normal petroleum fuels that will meet general product specifications as well as producing petrochemicals.

Attached tables I through XXII show economic and technical information on this alternate case.

The scheme presented indicates a fairly good return of common equity. It is estimated that a 60,000 B/D refinery following this scheme can be built in Puerto Rico at a cost of about $68 million, including working capital and start-up expenses. This cost exceeds the base case cost by $11 million. However, the payouts in both cases are similar and the net earnings on equity in the Isomax Case are over $9 million above the base case in a 20-year period.

The alternate case offers the following additional advantages:

1) The Isomax Process is characterized by an inherent ability to process a widely diversified range of charging stocks. Included in the list are not only the virgin stocks varying in boiling range from kerosenes to heavy vacuum gas oils, but thermal and catalytic cycle stocks as well.

2) In addition to versatility as regards charging stock Isomax is a very flexible process. Never before have refiners had such control over maximizing gasoline production or conversely middle distillate production. This is particularly important in order to meet changing market demands.

3) Due to the flexibility of Isomax, product inventories can be reduced.

4) The naphtha produced in an Isomax unit is an excellent feedstock for Platforming to produce high grade gasoline and/or aromatics.

5) High quality middle distillates are produced with Isomax.

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE II

ESTIMATED DIRECT OPERATING COST

	$/SD
1. Refinery Labor	
Including Maintenance, Safety, Warehouse and Utilities	6,868
2. Tetraethyl Lead	
Cost @ 0.2[illegible]¢/cc T.E.L.	1,645
3. Maintenance - Offsites and Process	5,985
4. Laboratory and Miscl. Supplies	200
5. Catalyst	
(a) Isomax catalyst @ 30 bbls/lb per stage @ $1.60/Lb	1,517
(b) Platforming catalyst	
1. B-T-X Platformer - 50 bbl/lb	623
2. Hvy.Naph.Platformer - 55 bbl/lb @ $3.45/lb net replacement	839
(c) Unifining catalyst	
1. Naphtha Unifiner @ 200 bbl/lb @ $1.60/lb	116
2. Distillate Unifiner @ 200 bbl/lb @ $1.05/lb	62
(d) Hydeal catalyst @ 5 bbl/lb @ $1.00/lb	248
Total Catalyst	3,405
6. Chemicals and Inhibitor	
(a) Gasoline additives	
1. Sweetening agent 3 lbs/1000 bbls @ $1.00/lb	39
2. Corrosion inhibitor, 6 lbs/1000 bbls @ 39¢/lb	30
3. Metal inhibitor 1 lb/1000 bbls @ $1.00/lb	13

TABLE II (contd.)

ESTIMATED DIRECT OPERATING COST

	$/SD
6. Chemicals and Inhibitor (contd.)	
(b) Corrosion inhibitor, ammonia, lime, amine, etc. @ 30¢/lb	42
(c) Water treating, $1.50 per day/1000 GPM Circ.	121
(d) Glycol @ 0.1 lb glycol/bbl of charge @ 17¢/lb	125
(e) Clay @ 0.5 lb clay/bbl of aromatics @ $30/ton	23
Total Chemicals	393
7. Royalties (Running Basis)	
(a) Isomax 5.5¢/bbl charge	782
(b) Platforming @ 5.5¢/bbl charge	1,234
(c) Unifining	
Naphtha Unifining - waiver	-
Distillate Unifining @ 1.5¢/bbl charge	178
(d) Hydeal @ 5% of naphthalen sale value and 0.5¢/gal benzene	797
(e) UDEX @ $250,000 amortized over 10 years	73
Total Royalties	3,064
8. Insurance	
Estimated @ 2.0% of process, offsites and inventories	3,678
9. Utilities	
Electricity @ 1.0¢/KWH	3,969
Fuel*	6,232
Cooling water @ 0.9¢/1000 gals once-through	770
Steam @ 55.0¢/1000 lb	2,033
Total Utilities	13,004
Total Direct Operating Cost	38,242

*Pitch used to supplement refinery gas.

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PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE III

ESTIMATED UTILITIES

Electricity	KW
Crude, Vacuum and Stabilizer Units	575
Light Naphtha Unifining Unit	290
Heavy Naphtha Unifining Unit	405
Distillate Unifining Unit	800
B-T-X Platforming Unit	1,632
Heavy Naphtha Platforming Unit	1,985
UDEX Unit	390
Naphthalene Hydeal Unit	1,310
Isomax and Gas Concentration Units	5,660
Visbreaking Unit	550
Hydrogen Plant	450
Subtotal	14,047
Offsites and Miscellaneous	2,490
Total	16,537

Fuel	10^6 BTU/Hr
Crude, Vacuum and Stabilizer Units	-327
Light Naphtha Unifining Unit	- 31
Heavy Naphtha Unifining Unit	- 46
Distillate Unifining Unit	- 38
B-T-X Platforming Unit	-142
Heavy Naphtha Platforming Unit	-185
UDEX Unit	- 3
Naphthalene Hydeal Unit	- 94
Isomax and Gas Concentration Units	-170
Visbreaking Unit	-104
Hydrogen Plant	-450
Subtotal	-1,590
Boiler House	-166
Total	-1,756

BTU/Day required	42,140 x 10^6 BTU
BTU/Day from fuel gas	18,720 x 10^6 BTU
BTU/Day needed to be purchased	23,420 x 10^6 BTU

Therefore 3,720 B/D pitch used to supplement refinery fuel gas.

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TABLE III (contd.)

ESTIMATED UTILITIES

Page 2

Cooling Water	GPM
Crude, Vacuum and Stabilizer	10,850
Light Naphtha Unifining Unit	980
Heavy Naphtha Unifining Unit	1,450
Distillate Unifining Unit	1,790
B-T-X Platforming Unit	4,050
Heavy Naphtha Platforming Unit	6,090
UDEX Unit	6,600
Naphthalene Hydeal Unit	6,000
Isomax and Gas Concentration Units	4,700
Visbreaking Unit	4,300
Hydrogen Plant	12,500
Miscellaneous	100
Total	59,410

Steam	1,000 Lbs/Hr
Crude, Vacuum and Stabilizer	-39.0
Light Naphtha Unifining Unit	-
Heavy Naphtha Unifining Unit	-
Distillate Unifining Unit	-
B-T-X Platforming Unit	-
Heavy Naphtha Platforming Unit	-
UDEX Unit	-99.0
Naphthalene Hydeal Unit	- 1.6
Isomax and Gas Concentration Units	-
Visbreaking Unit	-
Hydrogen Plant	-
Miscellaneous	-14.4
Total	-154.0
Visbreaker Steam Generator	+19.0
Boiler House	+135.0
Total	+154.0

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PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE IV

ESTIMATED PERSONNEL REQUIREMENTS

	Per Day*
Management	
Manager	1
Assistant Manager)	1
Process Superintendent)	
Chief Engineer)	1
Mech. Superintendent)	
Personnel Manager	1
Chief Chemist	1
Comptroller	1
With above:	
Secretaries	6
Total Management	12
Office	
General Accounting Manager)	1
Refinery Accounting Manager)	
Oil Accounting Manager	1
Material Accounting Manager	1
Accounting Clerks	2
Yield Accountant	1
Billing Clerk	1
Tanker Agent	1
Payroll Clerk	3
Shipping Clerk)	3
Purchasing Agent)	
Office Service:	
Receptionist/Telephone Operator	1
Stenographers and Typists	8
Total Office	23
Laboratory	
Chemists	6
Knock Tester	1
Podbielniak Operator	1
Technicians	11
Washers	3
Samples	4
Total	26

*5 day work week - 8 hours per day.

(cont'd.)

TABLE IV (contd.)

ESTIMATED PERSONNEL REQUIREMENTS

Page 2

	Per Day*
Safety	
Chief Safety Engineer	1
Assistant Chief Safety Engineer	1
Fireman and Safety Personnel	6
Total	8
Technical and Economics - Case I - Case II	
Technical Superintendent)	
Economics Superintendent)	1
Engineers	6
Secretary	1
Total	8
Warehouse	
Chief Storekeeper	1
Assistant	2
Clerks	2
Helpers	6
Total	11
First Aid	
Doctor	1
Medical Assistant	1
Nurses	3
Total	5
General Workers and Security	
Chief Watchman	1
Shift Watchman	15
Porters	4
Yardmen	4
Total	24

(contd.)

TABLE IV (contd.)

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ESTIMATED PERSONNEL REQUIREMENTS

Page 3

Maintenance	Per Day*
Chief Mechanical Engineer	1
Chief Civil Engineer	1
Draftsmen	[illegible]
Mechanical Foreman	[illegible]
Pipefitters	3
Pipefitters Helpers	9
Welders	2
Welders Helpers	2
Machinists	4
Machinists Helpers	[illegible]
Pump Mechanics	[illegible]
Pump Mechanics Helpers	3
Boiler Makers	4
Boiler Makers Helpers	4
Chief Electrician	1
Electricians	3
Electrician Helpers	3
Instrument Men	6
Carpenters	2
Carpenters Helpers	2
Painters	2
Painters Helpers	2
Insulator	4
Bricklayers	1
Bricklayers Helpers	
Mason	2
Mason Helpers	2
Truck Drivers	6
Garage Mechanics, etc.	[illegible]
Labor Foremen	[illegible]
Laborers	[illegible]
Total	136

Oil Movement	
Superintendent	1
Assistant Superintendent	1
Cargo Inspector	1
Pumpers	9
Pumpers Helpers	9
Gaugers	9
Dock Clerks	3
Pumpers	3
Pipe Fitters	4
Pipe Fitters Helpers	10
Truck Loaders	4
Truck Loaders Helpers	4
Oil Separator Operators	4
Total	62

(contd.)

TABLE IV (contd.)

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ESTIMATED PERSONNEL REQUIREMENTS

Page 4

Operations	Per Shift
Shift Foreman	1
Crude, Vacuum and Stabilizer	
Senior Operator	1
Board Man	1
Helper	2
Visbreaking Unit	
Senior Operator	1
Board Man	1
Helper	1
Naphtha Unifiner - BTX Platformer-UDEX	
Senior Operator	1
Board Man	2
Helper	3
Naphtha Unifiner - Platformer - Hydeal	
Senior Operator	1
Board Man	2
Helper	3
Distillate Unifiner	
Senior Operator	1
Helper	1
Isomax, Hydrogen Plant and Gas Concentration	
Senior Operator	1
Board Man	1
Helper	2
Boiler House	
Senior Operator	1
Water Treating and Pumping	2
Treaters and Splitter	
Board Man	1
Helper	1
Total	31

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE V

ESTIMATED PERSONNEL REQUIREMENTS AND COSTS

	No.	$/SD
Management	12	642
Office	23	262
Laboratory	26	346
Safety	8	100
Technical and Economics	8	176
Warehouse	11	132
First Aid	5	63
General Workers and Security	24	300
Maintenance	138	1,800
Oil Movement	62	583
Operations	131	2,414
Total	448	6,868

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PROCESSING AND ECONOMIC DATA
FOR A PROPOSED PUERTO RICO REFINERY

TABLE VI

ESTIMATED PROCESS INVESTMENT

Process Units	Material and Labor Costs
1. Crude Unit Including desalter, full corrosion protection and stabilizer	$ 2,000,000
2. Vacuum Unit	1,200,000
3. Light Naphtha Unifining Unit	550,000
4. Heavy Naphtha Unifining Unit	700,000
5. Distillate Unifining Unit	1,200,000
6. B-T-X Platforming Unit	1,800,000
7. Heavy Naphtha Platforming Unit	2,250,000
8. UDEX Unit	1,850,000
9. Naphthalene Hydeal Unit	3,100,000
10. Isomax and Gas Concentration Unit	6,600,000
11. Visbreaking Unit	2,100,000
12. Hydrogen Plant	2,750,000
13. C_3/C_4 Merox Unit	60,000
Process Units - Total M and L	$26,160,000
Design, engineering, contractor's expense and overhead	5,340,000
Total	$31,500,000
Allowance for ocean freight, local freight, unloading and hauling to site	4,000,000 ~~$ 2,300,000~~

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PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE VII

ESTIMATED OFFSITES FACILITIES INVESTMENT

	Material and Labor
Utilities	
Steam generating system	
Water treating facilities	
Fresh water supply	
Refinery fuel system	
Cooling water system	
Electric power system	
Compressed air system	$ 3,100,000
Service Facilities	
T.E.L. blending	
Fire fighting equipment	
Refinery flare and blowdown system	
Oil separation and retention pond	
Sewer system	
Telephone system	
Fencing and gates	
Roads and parking areas	
Truck load racks	1,400,000
Buildings and Contents	800,000
Tankage and Accessories	
Tankage	
Tankage accessories	
Transfer pumps	
Yard piping	10,000,000
	$15,300,000
Design, engineering, contractor's expense and overhead	3,000,000
	$18,300,000
Allowance for ocean freight, local freight unloading and hauling	2,300,000

Not included in above estimates are the following:

Land
Docks and wharfs
Site preparation
Piling if required

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

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TABLE VIII

ESTIMATED INITIAL INVENTORY REQUIREMENTS

	Barrels	Dollars
1. Charge Stocks		
Crude, 20 day inventory	1,200,000	2,820,000
2. Products		
Gasoline		
Premium, 25 days inventory	97,850	487,200
Regular, 25 days inventory	228,330	1,056,700
Benzene, 30 days inventory	28,000	352,800
Toluene, 30 days inventory	31,700	239,700
C8 Aromatics, 30 days inventory	33,100	208,500
Raffinate, 25 days inventory	119,500	482,900
Naphthalene, 30 days inventory	20,500	411,500
Mixed C3's, 15 days inventory	25,900	76,800
Mixed C4's, 15 days inventory	25,100	74,400
No.2 Fuel Oil, 25 days inventory	125,000	428,700
No.6 Fuel Oil, 25 days inventory	329,300	708,300
Total	1,064,280	4,527,500
3. Catalyst Initial Loading and a Spare Loading	Pounds	
Isomax	540,600	865,000
Naphtha Unifiners	64,600	103,400
Distillate Unifiner	44,500	46,700
B-T-X Platformer	52,600	286,700
Hvy. Naphtha Platformer	108,500	857,200
Hydeal	125,600	125,600
Total	2,123,100	2,284,600
4. Spare Parts	-	1,250,000
Total		8,062,100

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PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE IX

ESTIMATED STARTUP AND WORKING CAPITAL

Section 1 - Startup Capital	
A. Labor - 60 days supervision	$ 267,200
30 days operating and training	72,400
B. Utilities - 30 days startup and training	407,250
Total Startup Capital to Depreciable Capitalization	$ 746,850
Section 2 - Working Capital	
A. Charge Stock - 20 days inventory	$ 2,820,000
B. Products - necessary inventory	4,527,500
C. Direct Operating Costs - 30 days	757,140
Total Working Capital to Non-Depreciable Capitalization	$ 8,104,640

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

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TABLE X

ESTIMATED TOTAL INVESTMENT

Initial Catalyst and Chemical Loading and Spare Parts	$ 3,534,600
Process Investment	35,500,000
Offsites Investment	20,600,000
Startup and Working Capital	
(a) Depreciable	746,850
(b) Non-depreciable	8,104,140
Total	$ 68,485,590

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PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE XI

ESTIMATED GROSS MANUFACTURING MARGIN

Products	B/D	$/Bbl	¢/Gal	$/D
Gasoline, Premium	3,914	4.979	11.86	19,488
Regular	9,133	4.628	11.02	42,268
Total	13,057			61,756
Benzene	932	12.60	30.00	11,743
Toluene	1,058	7.56	18.00	7,998
C8 Aromatics	1,104	6.30	15.00	6,955
Raffinate	4,779	4.041	9.62	19,276
Naphthalene (¢/Lb)	687	-	(5.0)	13,716
Mixed C3's	1,725	2.964	7.06	5,113
Mixed C4's	1,674	2.964	7.06	4,962
No. 2 Fuel Oil	17,458	3.430	8.17	59,881
No. 6 Fuel Oil	5,000	2.151	5.12	10,755
Pitch	13,172	1.800	4.29	23,710
Value of Production	60,646			225,865
Charge				
Crude	60,000	2.350	5.60	141,000
Cost of Raw Material				141,000
Gross Manufacturing Margin				84,865

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FOR A PROPOSED PUERTO RICO REFINERY

TABLE XII

ESTIMATED REFINERY CONSOLIDATED YIELDS

Charge	B/D	Vol.%	Lbs/Hr	Wt. %
Tia Juana Medium Crude	60,000	100.0	780,046	100.00
Refinery Yield				
1. Gasoline				
Lt.St.Run	3,404	5.7	30,243	3.88
C_4-390° F Platformate	9,653	16.1	110,382	14.15
	13,057	21.8	140,625	18.03
2. Benzene	932	1.6	11,986	1.54
3. Toluene	1,058	1.8	13,250	1.70
4. C8 Aromatics	1,104	1.8	13,783	1.77
5. Raffinate	4,779	8.0	49,353	6.33
6. Naphthalene	687	1.1	11,430	1.47
7. Mixed C_3's	1,725	2.9	12,938	1.66
8. Mixed C_4's	1,674	2.8	14,386	1.84
9. No. 2 Fuel Oil	17,458	29.1	155,960	20.00
10. No. 6 Fuel Oil	5,000	8.3	79,145	10.15
11. Pitch*	13,172	22.0	212,631	27.23
12. Fuel Gas (F.O.E.)	2,975	5.0	64,558	8.28
	63,621	101.7	780,046	100.00

*Includes 3,720 B/D pitch used to supplement refinery fuel gas.

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PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE XIII

ESTIMATED CRUDE UNIT YIELDS

Charge	°API	B/D	Vol.%	Lbs/Hr	Wt. %	Lb/Gal
Tia Juana Medium Crude	27.1	60,000	100.0	780,000	100.0	7.429
Yields						
IBP - 165° F	-	2,040	3.4	17,706	2.27	-
165-270° F	62.0	5,100	8.5	54,288	6.96	6.087
270-450° F	45.4	7,680	12.8	89,544	11.48	6.660
450-650° F	38.6	11,880	19.8	143,988	18.46	6.926
650-1000° F	19.9	14,220	23.7	193,674	24.83	7.783
Vac. Bottoms	8.6	19,080	31.8	280,800	36.00	8.412
		60,000	100.0	780,000	100.00	

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

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TABLE XIV

ESTIMATED VISBREAKING YIELD

Charge	°API	B/D	Vol.%	Lbs/Hr	Wt. %	Lbs/Gal
Vacuum Bottoms	8.6	19,080	100.0	280,800	100.0	8.412
Yields						
H_2S				618	0.22	
H_2				28	0.01	
C_1				899	0.32	
$C_2=$				365	0.13	
C_2				1,207	0.43	
$C_3=$		153	0.8	1,151	0.41	
C_3		210	1.1	1,488	0.53	
C_4		210	1.1	1,769	0.63	
iC_4		57	0.3	534	0.19	
nC_4		76	0.4	702	0.25	
C_5-400° F	56.0	1,755	9.2	19,319	6.88	6.283
Fuel Oil, 300 Cs @ 210° F	8.6	17,172	90.0	252,720	90.00	8.412
		19,633	102.9	280,800	100.00	

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

E 1404

TABLE XV

ESTIMATED ISOMAX YIELDS

Charge	°API	B/D	Vol.%	Lbs/Hr	Wt. %	Lbs/Gal
Vacuum Gas Oil	19.9	14,220	100.0	193,680	100.0	7.783
H_2 (Chemical)				6,585	3.4	
				200,265	103.4	
Yields						
H_2S				2,905	1.5	
C_1				1,162	0.6	
C_2				1,162	0.6	
C_3				3,680	1.9	
C_4		1,095	7.7	9,103	4.7	
C_5/C_6		1,962	13.8	19,174	9.9	
C_7/400° F		6,939	48.8	80,377	41.5	
400-625° F	33	6,513	45.8	82,702	42.7	
Total		16,509	116.1	200,265	103.4	

Properties of Products

	C_5/C_6	C_7-400° F
F-1 Octane, Clear	80	56
+3cc.	97	79

PROCESSING AND ECONOMIC DATA
FOR A PROPOSED PUERTO RICO REFINERY

TABLE XVI

ESTIMATED B-T-X PLATFORMING YIELDS

Charge	°API	B/D	Vol.%	Lbs/Hr	Wt. %	Lbs/Gal
Unifined Virgin 165-270° F	62.0	5,100	56.54	54,273	56.57	6.0[illegible]
Unifined Virgin 165-270° F	63.4	810	8.9[illegible]	8,568	8.93	6.0[illegible]
Light Isomaxate	62.0	3,100	34.4[illegible]	33,090	34.50	6.0[illegible]
		9,020	100.0[illegible]	96,931	100.00	

Yields				
H_2			1,477	1.54
C_1			259	0.27
C_2			1,180	1.23
C_3	372	4.12	2,753	2.87
C_4's	537	5.9[illegible]	4,451	4.64
C_5's	494	5.4[illegible]	4,451	4.64
C_6 Paraffins	1,254	13.9[illegible]	11,953	12.46
C_7 Paraffins	1,214	13.4[illegible]	11,991	12.50
C_8 Paraffins	941	10.4[illegible]	9,555	9.96
C_9 Paraffins	327	3.6[illegible]	3,386	3.53
Methyl Cyclopentane	184	2.0[illegible]	1,995	2.08
Cyclohexane	26	0.29	297	0.31
C_7 Naphthenes	105	1.16	1,161	1.21
C_8 Naphthenes	44	0.49	499	0.52
C_9 Naphthenes	26	0.29	288	0.30
Benzene	390	4.32	4,950	5.16
Toluene	1,102	12.22	13,805	14.39
C_8 Aromatics	1,227	13.60	15,312	15.96
C_9+ Aromatics	487	5.40	6,168	6.43
	8,730	96.7[illegible]	95,931	100.00

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PROCESSING AND ECONOMIC DATA
FOR A PROPOSED PUERTO RICO REFINERY

TABLE XVII

ESTIMATED UDEX YIELDS

Charge

Depentanized Platformate - See Table
Estimated B-T-X Platforming Yields

Yields

Extract

Platforming Yields, B/D		Recovery Factors	Recovered
Benzene	390	99%	386
Toluene	1,102	96%	1,058
C8 Aromatics	1,227	90%	1,104

Raffinate

C_6 Paraffins	1,254
C_7 Paraffins	1,214
C8 Paraffins	941
C_{9+} Paraffins	327
Methyl Cyclopentane	184
Cyclohexane	26
C_7 Naphthenes	105
C8 Naphthenes	44
C_9 Naphthenes	26
Benzene	4
Toluene	44
C8 Aromatics	123
C_{9+} Aromatics	487

General Properties of Raffinate

F-1 Clear	62.0
F-1 +3cc.	80.0
RVP	3.5

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

E 1407

TABLE XVIII

ESTIMATED HEAVY NAPHTHA PLATFORMING YIELDS

Charge	°API	B/D	Vol.%	Lbs/Hr	Wt. %	Lbs/Gal
Unifined Virgin 270-450° F	45.4	7,680	57.21	89,507	57.30	6.660
Unifined Visbrkr. 270-400° F	50.2	945	7.04	10,759	6.89	6.483
Heavy Isomaxate	45.4	4,800	35.75	55,942	35.81	6.660
	45.8	13,425	100.00	156,208	100.00	

Yields				
H_2			1,968	1.26
C_1			3,452	2.21
C_2			4,421	2.83
C_3			5,967	3.82
C_4's	772	5.75	6,483	4.15
C_5's	765	5.70	7,014	4.49
Hexanes+	10,341	77.03	126,903	81.24
	11,878	88.48	156,208	100.00

Deprop. Bottoms - C_4+ Platformate

	B/D	°API	RVP	F-1 Cl.	F-1+3cc.
Total Bottoms	11,586	42.1	6.07	94.9	99.8

Platformate Split

	°API	B/D	Vol.%	Lbs/Hr	Wt. %	Lbs/Gal
C_4-390° F Platf.	48.8	9,653	83.3	110,384	80.23	6.534
390 E.P. Platf.	15.0	1,933	16.7	27,205	19.77	8.044
	42.1	11,586	100.0	137,589	100.00	6.786

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

E 1408

TABLE XIX

ESTIMATED NAPHTHALENE HYDEAL YIELDS

Charge	°API	B/D	Vol.%	Lbs/Hr	Wt. %	Lb/Gal
Hvy. Platformate	15.0	1,933	100.0	27,205	100.0	8.044
H_2(710 SCF/100#)	-	-	-	1,027	3.78	-
				28,232	103.78	
Yields						
Benzene	28.3	546	28.3	7,074	26.00	7.375
Naphthalenes				11,430	42.00	
Hvy. Aromatics	31.0	65	3.3	817	3.00	7.251
Fuel Gas(methane)				8,918	32.78	
				28,239	100.00	

Fuel Gas*- 1,840 bbl F.O.E.

*Fuel gas containes components both from Hydeal operations and the heavy naphtha Platformer separator gas.

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE XX

ESTIMATED GAS CONCENTRATION UNIT YIELDS

	Crude Lbs/Hr	Hvy.Nap. Platf. Lbs/Hr	B-T-X Platf. Lbs/Hr	ISOMAX Lbs/Hr	Visbkr. Lbs/Hr	Total Lbs/Hr	Fuel Gas Lbs/Hr	BTU/Lb	Recovered Lbs/Hr	Recovered B/D
H_2	-	37	23	-	28	88	88	61,029	-	
C_1	-	401	27	1,162	899	2,489	2,489	23,886	-	
$C_2^=$	-	-	-	-	365	365	365	21,639	-	
C_2	-	1,802	440	1,162	1,207	4,611	4,611	22,325	-	
$C_3^=$	-	-	-	-	1,151	1,151	173	21,047	978	128
C_3	2,890	4,038	1,831	3,680	1,488	13,927	2,089	21,664	11,838	1,597
$C_4^=$	-	-	-	-	1,769	1,769	35	20,766	1,734	196
iC_4	222	313	343	5,917	534	7,329	11	21,239	7,318	890
nC_4	510	383	238	3,186	702	5,019	14	21,301	5,005	588
	3,622	6,974	2,902	15,107	8,143	36,748	9,875		26,873	3,399

Recovery Factors

C_3's 85%
C_4's 98%

Fuel Gas: 860 bbl F.O.E.

E 1409

E 1409

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE XXI

ESTIMATED GASOLINE POOL

Components	B/D	Vol. %	F-1 Cl.	F-1+3cc	RVP
Lt. St. Run	3,404	26.1	78.5	96.0	26.00
C_4-390° F Platformate	9,653	73.9	92.5	98.6	5.50
	13,057	100.0	88.4	98.0	10.0

T.E.L. requirement to meet pool octane of 95.7 = 1.2cc T.E.L./Gal

PROCESSING AND ECONOMIC DATA

FOR A PROPOSED PUERTO RICO REFINERY

TABLE XXII

ESTIMATED H_2 PRODUCTION AND CONSUMPTION

Production

B-T-X Platformer	9,020 B/D x 729 SCF/Bbl	=	6.6 x 10^6SCF/D
Hvy. Nap. Platformer	13,380 B/D x 647 SCF/Bbl	=	8.7 x 10^6SCF/D
Hydrogen Plant		=	30.0 x 10^6SCF/D
			45.3 x 10^6SCF/D

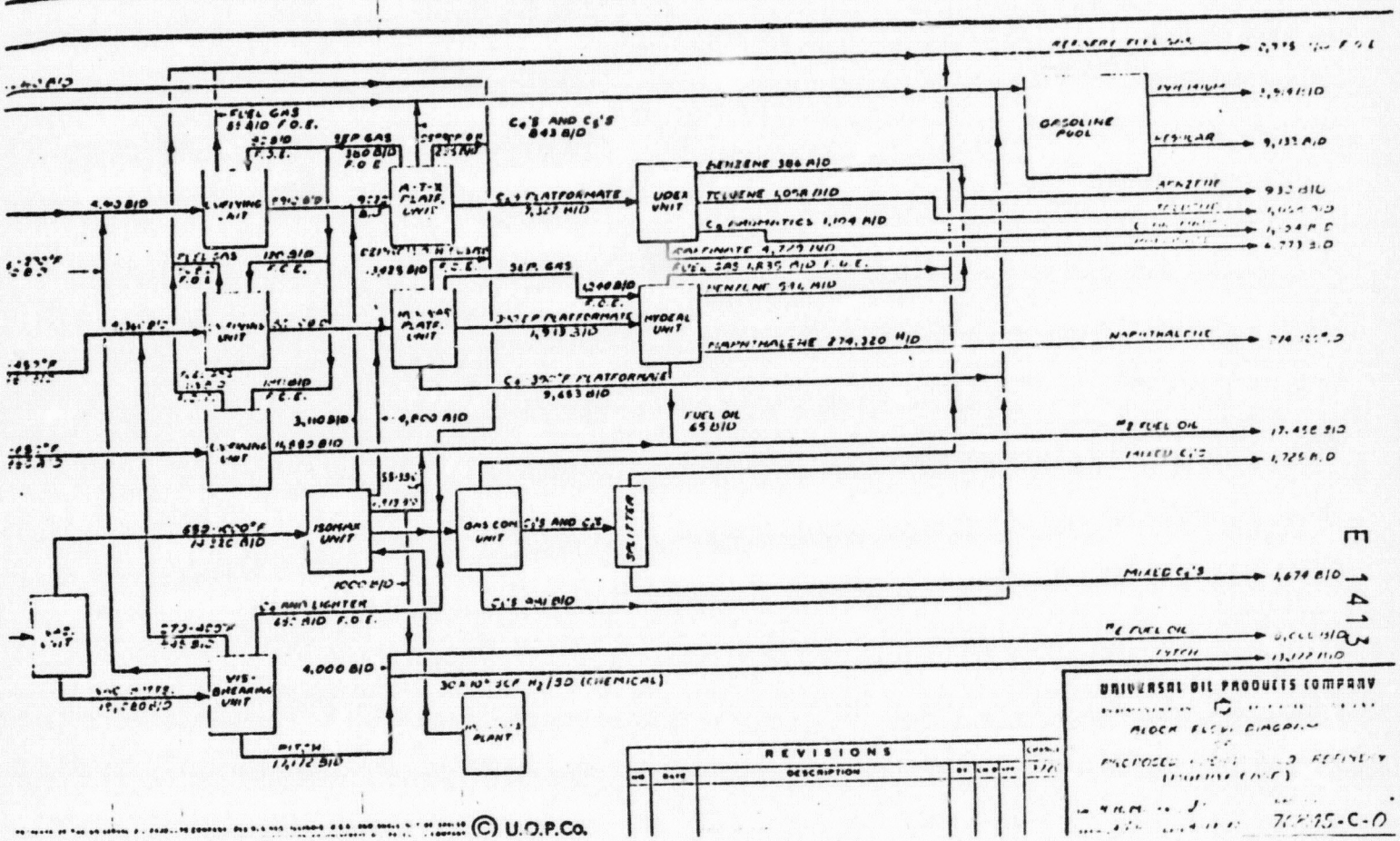
Consumption*

Lt.Nap.Unifiner	5,910 B/D x 108 SCF/Bbl	=	0.6 x 10^6SCF/D
Hvy.Nap.Unifiner	8,580 B/D x 117 SCF/Bbl	=	1.0 x 10^6SCF/D
No.2 F.O.Unifiner	11,880 B/D x 126 SCF/Bbl	=	1.5 x 10^6SCF/D
Hydeal Unit	1,933 B/D x 4498 SCF/Bbl	=	8.7 x 10^6SCF/D
Isomax Unit	14,220 B/D x 2150 SCF/Bbl	=	30.6 X 10^6SCF/D
			42.4 x 10^6SCF/D

*Consumption includes chemical and solution losses.

APPENDIX B

E1412


GASOLINE POOL
BENZENE 386 B/D
TOLUENE 1,098 B/D
HYDRAL UNIT
NAPHTHALENE 274,320 #/D
FUEL OIL 65 B/D
ISOMAX UNIT
GAS CON UNIT
SPLITTER
MIXED C4'S 4,674 B/D
4,000 B/D
VIS-BREAKING UNIT
PITCH 14,172 B/D
REVISIONS
DESCRIPTION
UNIVERSAL OIL PRODUCTS COMPANY
BLOCK FLOW DIAGRAM

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